Rules for Domestic Class
U.S. Fishing Vessels

Class Notation: ✠ DC FV (US)

Tentative Rules v6.7

November 2014

DNV GL AS

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Preamble

DNV GL is a classification society with the objective of safeguarding life, property, and the environment.

DNV GL generally operates through the limited company DNV GL AS, company registration number 945 748 931, which operates through a worldwide network of offices.

DNV GL AS has on 27th November 2013 changed its name from Det Norske Veritas AS. For further information, see www.dnvgl.com. Any reference in this document to "Det Norske Veritas AS" or "DNV" shall therefore also be a reference to "DNV GL AS".

DNV GL AS carries out classification, quality assurance and certification of ships, facilities and systems, and carries out research in connection with these functions. In the U.S., these operations are executed by Det Norske Veritas (U.S.A.), Inc.

With respect to DNV Rules for the Classification of Ships in worldwide commerce, reference within those rules to "DNV" or "the Society" (as may be used interchangeably) means DNV GL AS.

With respect to these DNV GL Rules for US Domestic Class for Fishing Vessels, references within these rules to "DNV" or "the Society" (as may be used interchangeably) means DNV GL AS or any of its subsidiaries performing services under these rules.
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Publications and information
DNV GL issues a number of publication which may be of interest for builders and operators of fishing vessels. For general information on maritime services, see http://www.dnvgl.com/maritime/default.aspx#5. Ship classification is described in more detail at http://www.dnv.com/industry/maritime/servicessolutions/classification/index.asp, and service documents, such as classification rules, may be downloaded free of charge at http://exchange.dnv.com/servicedocuments/dnv. .

For further advice, contact DNV GL.

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For definition of terms, see Part I, Chapter 10.3 of this document.

Amendments and Corrections
This document is valid until superseded by a new revision or withdrawn.

This document may be subject to change and interpretation by DNV GL at any time and without prior notification.

Comments may be sent by e-mail to houeocapproval@DNVGL.com or rules@DNVGL.com
Comprehensive information about DNV GL and the Society's services is found at the Web site http://www.DNVGL.com

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PART I – GENERAL REGULATIONS

1.0 Chapter 1 – General

1.1 Introduction

1.1.1 Title 46 U.S. Code, Section 4503 (as amended by P.L. 111-281, and further amended by P.L. 112-213), requires fishing vessels over 50 feet built after July 1, 2013, to meet survey and classification requirements prescribed by a recognized Classification Society. Pursuant to this statute, DNV has developed these rules for Domestic Classification (the "Rules") to define the classification requirements by which it may issue Domestic Class certificates to vessels covered by the statute. These rules are partly based on other DNV standards, namely DNV's Rules for Classification of Ships, DNV Standards for Certifications, DNV Guidelines, applicable U.S. Code of Federal Regulations, and other U.S. Federal and International requirements for the commercial fishing industry vessels, where relevant.

1.1.2 Classification is a system for safeguarding life and property at sea, and the environment due to operational consequences. It implies a process of verifying vessel standards against a set of requirements. The requirements are laid down in the rules established by the Society.

1.1.3 Classification implies an activity, in which the vessel is surveyed during construction on the basis of design approval, tested before being put into service, and surveyed regularly during its whole operational life until it is scrapped. The aim is to verify that the required rule standard is built in, observed and maintained.

1.1.4 Classification is not a substitute for the client's own quality and safety control and related duties, or the client's obligations to third parties, nor to relieve the client of any consequences of default. The classification under these rules requires that rule requirements are verified at regular intervals. It is the owner's responsibility to maintain the vessel so as to comply with the rules at all times.

1.1.5 Classification described herein does not ensure conformance with mandatory U.S. Coast Guard requirements applicable to U.S. fishing vessels. However, compliance with such mandatory requirements is a prerequisite for classification, and evidence of compliance will be required. The Society may separately issue such certificates upon request and as authorized by the U.S. Coast Guard.

1.1.6 The classification services described herein apply to the *newbuilding* and *operation* of U.S. domestic fishing vessels described below in Section 1.2 of Chapter 1, "Application to Vessels." These rules contain, or reference documents containing, the information required to build and maintain U.S domestic fishing vessels classified under these rules.

1.1.7 The rules lay down technical and procedural requirements related to obtaining and retaining a domestic class certificate.

1.1.8 The rules establish requirements for the design, construction, survey and testing of vessels.

1.1.9 The rules establish requirements for the assignment and retention of main class and for optional notations.

1.1.10 The rules also establish requirements for certification of materials, components and systems, the extent of which depends on the scope of main class and optional notations. See Section 9.

1.1.11 The Society keeps complete files on all classed vessels, including the documentation required by these rules. Reports will not be disclosed to any party, apart from the national authorities involved, without the owner's consent. The Society also undertakes all reporting to national authorities required in connection with issuance of Domestic Class certificates, or any certificates issued on behalf of the flag administration.

1.1.12 The Society is a "qualified organization" pursuant to Title 46 U.S. Code, Section 4503 et seq. as approved by the United States Coast Guard.

1.1.13 The Society runs a program for training and qualification of its technical personnel to ensure correct, uniform quality of approval and survey work throughout the organization.

1.1.14 The Society operates a network of survey stations in ports strategically located throughout the world, including North America. Efficient reporting and information systems support the operations, and provide consistent service to clients and national authorities.

<<<<Guidance Note>>>>

For further information on the classification system, rules and definition of terms used in this context, see DNV Rules for Classification of Ships, Part 0 Chapter 2 "Introduction to Classification", and Part 1 Chapter 1 Section 1 "Classification Principles".

<<<<End Guidance Note>>>>

1.2 Application to Vessels

1.2.1 These rules apply to U.S. domestic new-build commercial fishing vessels of 15.24 m (50 ft.) to 45 m (148 ft.) overall in length, where "overall in length" means the horizontal distance of the hull between the foremost part of the stem and aftermost part of the stern excluding fittings and attachments, that are subject to Section 4502(b) of Title 46 U.S. Code. See 1.1.1 above. Fishing vessels with lengths less than indicated may be classed upon special consideration. Fishing vessels with lengths exceeding 45 m (148 ft.), or other fishing or fish processing vessels that already require classification, may be classed using DNV's Rules for Classification of Ships, with additional reference to Part 5 Chapter 6.

1.2.2 These rules apply to fishing vessels with a speed not exceeding 15 knots. For vessels with a speed in excess of 15 knots, contact DNV.

1.2.3 The "date of build" in DNV's interpretation is the date of signing of the "contract for construction" between the prospective owner and the vessel builder. If the keel of the vessel is laid prior to a signed "contract for construction", the "date of build" is to be taken not later than

the date the keel is laid or the vessel is at a similar stage of construction. The classification rules to be used for a new-build are generally those in force at the "date of build".

<<<<Guidance Note>>>>

The term "…built after 1 July 2013…" in 1.1.1 above, as used in the referenced statute, has been defined in 46 U.S.C Section 4503 as follows:

"For the purposes of this section, the term 'built' means, with respect to a vessel, that the vessel's construction has reached any of the following stages:
(1) The vessel's keel is laid.
(2) Construction identifiable with the vessel has begun and assembly of that vessel has commenced comprising of at least 50 metric tons or one percent of the estimated mass of all structural material, whichever is less."

<<<<End Guidance Note>>>>

1.2.4 These rules apply to commercial fishing vessels constructed of steel. For commercial fishing vessels constructed of other materials, please contact DNV GL for further details. See Part III 1.3.

Other materials may be used for certain local structures; see Part III – Materials and Manufacturing, and Part IV – Structures.

<<<<Guidance Note>>>>

See Part VII "Appendices" for guidance concerning materials other than steel.

<<<<End Guidance Note>>>>

1.3 Statutory Certification

Fishing vessels are generally referred to as "non-convention" vessels, i.e. they are often excluded from international IMO conventions such as SOLAS, MARPOL and Load Lines. The flag administration (U.S. Coast Guard) may however include requirements to statutory certification as evidence of compliance with U.S. or international regulations as a condition of registry. DNV may issue such statutory certificates as authorized by the U.S. Coast Guard.

<<<<Guidance Note>>>>

As per 46 U.S.C 5101 and U.S. Coast Guard regulations, fishing vessels built after 1 July 2013, 24 m (79 ft.) and more overall in length shall have an assigned load line.
Fishing vessels operating beyond 3 NM must meet requirements given in 46 CFR Part 28 and be issued a Certificate of Compliance.

<<<<End Guidance Note>>>>

1.3.1 Statutory certificates issued for vessels classed by DNV under these Domestic Rules for U.S. Fishing Vessels are in general to be issued only by DNV or the U.S. Coast Guard.

1.4 Objectives

1.4.1 These rules lay down technical and procedural requirements related to obtaining and retaining a Domestic Class Certificate. For further details, see Chapters 3 and 4.

1.4.2 These rules can be used as a contractual document between vessel builder and vessel owner and include class requirements and acceptance criteria. Conformance to the rules does not ensure compliance with any mandatory national or international regulations.

2.0 Chapter 2 - Classification and Class Notations

2.1 General

2.1.1 The classification concept consists of the development and application of rules with regard to design, construction and survey of vessels. In general, the rules cover:

a) the structural strength (and where relevant the watertight integrity) and integrity of essential parts of the vessel's hull and its appendages; and

b) the safety of all installations, and safety and availability of the main functions.

2.1.2 Class is assigned to a vessel on the basis of compliance with the rules. Class is maintained in the service period provided applicable rules are observed and surveys carried out.

2.1.3 All vessels being assigned class with the Society will be given a class notation consisting of a construction symbol, a main character of class, service area restriction notations and main vessel type notations, as applicable.

2.2 Construction Symbols

2.2.1 The construction symbol ✠ may be assigned to vessels built under the supervision of the Society.

2.2.2 The construction symbol ✠ may be assigned to vessels built under the supervision of a recognized classification society and later assigned class with the Society. For such vessels the class notations which the Society considers to have the equivalent intent will be assigned.

2.2.3 Vessels other than those described in 2.2.1 and 2.2.2 will not be assigned construction symbol when classed with the Society.

2.3 Main Character of Class

2.3.1 The notation **DC** may be assigned to vessels with hull, machinery, systems and equipment found to be in compliance with applicable rule requirements as given in Parts II - VI.

2.3.2 The notation **DC** may also be assigned to vessels designed and constructed in accordance with the rules of another classification society, and later assigned class with the Society.

2.4 Optional Class Notations

2.4.1 Optional class notations may be assigned to vessels meeting corresponding rule requirements. These are mentioned separately in this document.

2.5 Service Area, and Service Area Notations

2.5.1 A vessel designed and built to these rules, i.e. U.S. Domestic Class for fishing vessels, may operate in waters as determined by the U.S. Coast Guard. This includes U.S. waters as well as adjacent international waters, for the purpose of fishing and associated activities.

2.5.2 Generally, the fishing vessels designed and built to these rules are intended to be capable of operating in all ice free regions. See also 2.5.5 below. Should design calculations indicate that a vessel cannot operate in all waters, service area notations will be used to define the vessel's operating limits. The DNV service area notations correspond to U.S. Coast Guard designations as defined below, see 2.5.4.

2.5.3 The notation **R** followed by a number or a letter will be given to fishing vessels with certain modifications to arrangement, equipment, or scantlings in relation to vessels normally built for winter weather conditions in the open ocean.
The DNV service area restrictions, given in nautical miles and representing the maximum distance from nearest port or safe anchorage, are given in the following table:

Service Area Restrictions			
	Seasonal zones (nautical miles)		
Service area notation	*Winter*	*Summer*	*Tropical*
R0	250	No restrictions	No restrictions
R4	5	10	20
RE	Enclosed waters		

2.5.4 Service area restrictions as defined by the U.S. Coast Guard; reference 46 CFR: Shipping 175.400:

- **Exposed (or open) Waters** - No DNV service area notations required, or may be used with **R0**.

  A term used in connection with stability criteria and means: (1) Waters, except the Great Lakes, more than 20 nautical miles from a harbor of safe refuge; (2) Those portions of the Great Lakes more than 20 nautical miles from a harbor of safe refuge from October 1 of one year through April 15 of the next year (winter season); and (3) Those waters less than 20 nautical miles from a harbor of safe refuge that the cognizant Officer in Charge, Marine Inspection, determines are not partially protected waters or protected waters because they present special hazards due to weather or other circumstances.

- **Partially Protected Waters** – DNV service area notation **R4**

  A term used in connection with stability criteria and means: (1) Waters not more than 20 nautical miles from the mouth of a harbor of safe refuge, unless determined by the cognizant OCMI to be exposed waters; (2) Those portions of rivers, estuaries, harbors, lakes, and similar waters that the cognizant OCMI determines not to be protected waters; and (3) Waters of the Great Lakes from April 16 through September 30 of the same year (summer season).

- **Protected Waters** – DNV service area notation **RE**

  A term used in connection with stability criteria and means sheltered waters presenting no special hazards such as most rivers, harbors, and lakes, and that is not determined to be exposed waters or partially protected waters by the cognizant OCMI.

2.5.5 For fishing vessels built to operate in ice, requirements given in connection with DNV's ice class notations may be used.

2.5.6 Other notations may also be used for vessels built to specifications exceeding these fishing vessel Domestic Class rules.

3.0 Chapter 3 - Assignment of Class

This chapter describes the implementation of classification services for new-build domestic fishing vessels in accordance with these rules.

<<<<Guidance Note>>>>

For assignment of class to vessels already built or in operation, please contact the Society for guidance.

<<<<End Guidance Note>>>>

3.1 **Request for Class** - The builder initiates the process by submitting a request for classification to the Society, which shall be sent to the local DNV office and include:

- name and address of the applicant
- name and address of the builder (yard, manufacturer, owner of the design)
- vessel specification and type designation; chosen area of operation; class notations
- build schedule
- technical documentation

3.2 Any subcontracting may be subject to a separate agreement

3.3 The Society decides the extent of examinations, tests and inspections required to complete the relevant procedure in each case.

3.4 Documentation of the builder's Quality Assurance System shall be submitted for evaluation

3.5 **Plan Approval** - The builder or designer shall submit plans, specifications, related technical descriptions and data, for approval.

3.5.1 The Society may provide a list of documentation required for the specific notations requested. See also the "Guidance" in Appendix Part VII, and list of drawings, plans and specifications required for plan approval as specified in the applicable Parts of these rules.

3.5.2 The builder or designer should submit documentation, such as calculations, to show that rules, regulations and relevant design criteria have been met. A review and statement by a registered Professional Engineer (PE) may be considered as meeting this requirement.

3.5.3 Documents subject to approval will be examined by the Society. The results of the examination will be stated in a letter of approval. Comments, conditions and limitations may be stated on the plans returned or in an accompanying letter.

3.5.4 Any documents submitted for re-approval shall be especially marked to identify revised parts.

3.6 **Inspection During Construction** - During the building period the Society will carry out surveys at the building yard and its suppliers. The method and extent of survey will be decided by the Society taking into account the builder's quality system. The purpose of the surveys is to verify that the construction, components and equipment satisfy the rule requirements and are in accordance with the approved plans, that required materials are used, and that functional tests are carried out as prescribed by these rules.

3.7 **Testing** – Functional tests of major equipment, key systems, or items of particular importance for safe operation, may require tests witnessed by the Society. Sea trial(s) may be required.

3.8 **Compliance with mandatory U.S. Coast Guard** requirements for fishing vessels is required for assignment of class under these rules.

3.9 **Domestic Class Certificate** - When satisfied that all requirements corresponding to the class in question have been met, the surveyor will issue the domestic class certificate. The domestic class certificate is valid for a period of 5 years from the date of class assignment, provided conditions for retention of class (see Chapter 4) are complied with.

The vessel domestic class certificate shall contain the following information as applicable:

- the name and address of the Builder (yard, manufacturer)
- the identification of the product - vessel type designation; yard number
- reference to the rules and regulations applied
- reference to compliance with Title 46 U.S. Code, Section 4503
- class notations
- specification of exemptions or equivalent standards
- any restrictions/limitations in the use of the vessel
- validity/date of expiration
- date of issue and signatures

3.10 Class may be assigned with Conditions of Class (CC). A CC constitutes a requirement that specific measures, repairs or surveys shall be carried out within a specific time limit in order to retain class.

4.0 Chapter 4 - Retention of Class

4.1 The vessel shall be adequately manned, and the hull, machinery, systems and equipment shall be competently handled and maintained to rule standards at all times.

4.2 The customer (or owner, see definitions in 10.3) shall

4.2.1 provide complete and correct information on the ownership and management of the vessel.
4.2.2 provide correct and current information on the vessel
4.2.3 pay all fees and expenses due to the Society. The owner has, together with managers, charterers and operators, a joint and several liability for any such fees and expenses.

4.3 Compliance with the rule requirements in the operational phase is verified by the Society through a system of periodical surveys. The most comprehensive survey is carried out in connection with the renewal of the five-year domestic class certificate. During the five year period the vessel undergoes annual surveys covering various parts, equipment and systems, depending on the notations assigned.

4.4 It is the Owner's responsibility to request the Society to attend any periodical surveys. Also, the Owner is responsible to request survey of any damage or condition that may affect the vessel meeting the requirements of these Rules.
The Owner is responsible to provide access and necessary facilities for the safe execution of surveys.

4.5 The annual surveys are to be carried out at the anniversary date of the domestic class certificate, within a time window of 3 months on either side of the anniversary date.

4.6 In exceptional cases an adjustment of the periodical surveys and anniversary date may be granted to correspond to the seasonal fishing schedules. Such adjustments may only be made if the time between any two periodical surveys will not exceed 18 months.
A written application by the vessel operator for consideration by the Society is required. The request for adjustment is to be submitted prior to the anniversary date of the class certificate.

4.7 **Annual surveys**.

4.7.1 The objective of the annual survey is to ascertain the general condition of the vessel, and to confirm that the structures and equipment required by these rules are maintained and fully operational.

4.7.2 The minimum scope is

a) Overall visual examination of all tanks, holds and spaces, as well as accessible parts of the outside of the vessel and closing appliances, with a focus on fire safety, wear, watertight integrity, maintenance and possible damages.
b) Visual and functional tests of machinery, systems and equipment, including safety functions and alarms. Shielding and insulation of hot surfaces are to be surveyed.
c) Examination of maintenance records including follow-up of manufacturer's recommended service scheme.
d) Verification of compliance with mandatory U.S. Coast Guard requirements.

4.7.3 At the discretion of the attending surveyor, some of these inspections may be carried out by the owner's representative or vessel officer. Records of such owner's inspections are to be presented to the attending surveyor. Acceptance of such records is decided by the DNV surveyor; however, verification by the surveyor will be carried out as needed.

4.8 The domestic class certificate will be endorsed by the surveyor upon satisfactory completion of annual surveys for main class.

4.9 **Renewal surveys**.

4.9.1 The renewal survey is a major survey including visual examinations, measurements and testing of the hull and equipment, machinery and systems, in order to confirm that the vessel complies with the relevant rule requirements and is in a satisfactorily maintained condition. The required examinations, measurements and tests shall be carried out before the renewal survey is regarded as completed.

4.9.2 Surveys carried out within 12 months prior to the 5 year anniversary date, and separate from the 4th annual survey, may be credited towards the renewal survey.

4.9.3 In addition to all items specified for the annual surveys (4.5.2) the overall scope is to include

a) Bottom survey in drydock or on a slip-way.
This survey is to include examination of hull plating, openings (valves), rudder with attachments and bearings, propeller, exposed part of propeller shaft and bearings, propellers brackets, and thrusters.
b) Ballast tanks are to be pressure tested with water to the top of air pipe.

c) Other tanks, including RSW tanks, may require testing as determined by the attending surveyor.
d) The surveyor may require thickness measurements in any portion of the structure where signs of wastage are evident.
e) Machinery items may require opening up as determined by the attending surveyor.
f) The insulation resistance of the electrical system is to be measured, and the results presented to the surveyor.
g) Some of these inspections may be carried out by the owner's representative, in accordance with item 4.5.3. Irrespective of this, a DNV surveyor is always required to attend the bottom survey.

4.10 A new domestic class certificate will be issued to replace the existing class certificate when the renewal survey has been satisfactorily completed and the Society is satisfied that the requirements for retention of class have been met.

4.11 At the periodic surveys, the Society will evaluate the extent of possible sustained damage, and verify the ensuing repairs. Deferred repairs may in some cases be accepted, but will then always be given with a Condition of Class (CC), with a maximum time limit. See Section 3.10 above.
No CC should be issues in connection with the renewal surveys, except for minor issues.

4.12 When transferred to another owner or manager, the previous owner shall give the Society immediate notice, in writing. Also, the new owner shall provide all information as given in 4.2. Obligations according to the rules shall remain with the previous customer (owner) until the Society is in receipt of such written notice.

4.13 *Reserved.*

4.14 Alterations involving change of main dimensions, type of service or any other matters described in these rules are to be reported to the Society. Approval and surveys may be required.

5.0 Chapter 5 – Suspension, Withdrawal and Reinstatement of Class

5.1 The Society may suspend or withdraw a vessel's class at any time where the conditions for retention of class have been violated (see Chapter 4).

5.2 When class is suspended or withdrawn the Society will:

- notify the owner in writing
- notify the flag administration
- make an entry to this effect in the Society's records

5.3 The class will automatically be suspended with immediate effect if the renewal surveys related to main class are not completed before the expiration date of the class certificate, and no postponement or adjustment of the class certificate anniversary date as per item 4.4 has been granted, or unless the vessel is under attendance for completion of the survey.

5.4 If the annual surveys for main class are not completed within 3 months from the anniversary date of the class certificate, the class is suspended with immediate effect, unless an adjustment of the due date has been granted as per item 4.4, or the vessel is under attendance for completion of the survey.

5.5 If due to force majeure, the vessel is not in port when surveys become overdue the Society may allow the vessel to sail, in class, directly to an agreed discharge port and then to an agreed repair facility at which the survey can be completed.

5.6 If any outstanding debt owed to the Society is not paid within a notified date, the Society may suspend the vessel's class with immediate effect.

5.7 In addition to the conditions above, a vessel's class may be suspended with immediate effect in cases where:

- DNV has not been notified of damages or conditions falling within scope of class
- repair of deficiencies has not been carried out or otherwise dealt with in an appropriate manner, or repair of deficiencies has not been surveyed and accepted by the surveyor
- other requirements have been imposed by the Society.

5.8 If the overdue surveys or conditions leading to class suspension are carried out within the specified time, the class may be reinstated at the Society's discretion.

5.9 The class will be withdrawn at the customer's request.

5.10 If the overdue surveys, conditions or required repairs are not carried out within the specified time after the class suspension, the Society may withdraw the vessel's class at the Society's discretion.

5.11 If the customer makes a general assignment for the benefit of his creditors or if any proceedings are commenced in court or any order or judgment is given by any court for liquidation, winding up of the customer, the Society may withdraw the class with immediate effect.

5.12 If the circumstances leading to withdrawal of class no longer exist, a vessel's class may be re-assigned upon written request. The extent of survey will in such instances be decided by the Society. The Society reserves the right to decline an application for re-assignment of class.

5.13 When the vessel's class is re-assigned, the Society will confirm this in writing to the customer and to the flag administration.

6.0 Chapter 6 - Assumptions and Obligations

6.1 Classification is performed on the basic assumption that all parties involved (designer, builder/yard, manufacturer, design-owner, sub-contractor, owner, etc.) fulfill their individual obligations. Classification is not performed in substitution of other parties' role or obligations. Nothing contained in DNV services, certificate, report or document issued in connection with or pursuant to these requirements, shall relieve any designer, engineer, builder, manufacturer, yard, seller, owner, operator or other parties from any obligations or consequences of default whatsoever.

In particular, compliance with the requirements does not imply acceptance or commissioning of a vessel. This is the exclusive responsibility of the Owner. Also, it is the Owner's responsibility to maintain the vessel to these rules.

6.2 The relation between the Customer (i.e., designers, builders/yards, vessel owners and/or operators) and DNV is regulated in an Agreement signed by both parties. The Agreement specifies the scope of the classification service, the fee, terms of payment and legal obligations.

7.0 Chapter 7 - Legal Provisions

7.1 If any person suffers loss or damage which is proven to have been caused by any negligent act or omission of the Society, then the Society shall pay compensation to such person for his proven direct loss or damage. However, the compensation shall not exceed an amount equal to five times the fee charged for the service in question. The maximum compensation shall not exceed $300,000.

In this provision "the Society" shall mean DNV GL AS as well as all its direct and indirect owners, affiliates, subsidiaries, directors, officers, employees, agents and any other acting on behalf of DNV GL AS.

7.2 *Reserved.*

7.3 These rules are under the sole ownership rights and copyrights of the Society. It is prohibited by anyone else than the Society to offer and/or perform classification or other services including issuance of certificates and/or declarations of conformity, wholly or partly, on the basis of and/or pursuant to these rules without the Society's prior written consent. The Society is not responsible for the consequences arising from any use of the rules by others.

7.4 These rules, the classification of the vessels and the relationship between the Society and other parties shall be governed by the laws of Texas.

7.5 Any dispute arising in relation to or as a consequence of these rules shall be resolved by the federal or state courts of Harris County, Texas.

8.0 Chapter 8 - *Reserved*

9.0 Chapter 9 – Certification

9.1 Certification of Materials, Components and Machinery

9.1.1 In general, "U.S. fishing vessel industry accepted standard" will be acceptable for materials and components. Independent certification of materials and machinery may be required depending upon type of component, manufacturer's documentation, industry acceptance, or documented reliability over time. DNV reserves the right to inspect and if necessary reject key components and materials of unknown origin, unproven, or not considered "industry accepted standard".

<<<<Guidance Note>>>>

It is anticipated that certain equipment or machinery critical for the safety and functions of the vessel will be delivered with 3rd party certification, e.g. main switchboard, main engine, propeller, propeller shafting and gear. For instance, with reference to Part V Chapter 1, 1.3.1, engines exceeding 2500 kW are to be certified by DNV or another recognized organization.

<<<<End Guidance Note>>>>

9.1.2 DNV Product Certificates, or DNV Type Approval Certificates, will always be acceptable.

9.1.3 For some equipment certification or acceptance by the U.S. Coast Guard may be required. This includes certain lifesaving, fire and other safety equipment; see Part VI.

9.2 DNV Certificates for Materials and Components (CMC) – if required

9.1.1 See DNV Standard for Certification

a) No. 1.1. General description of the CMC services
b) No. 1.2. Type Approval

These publications are available on the web site given in 10.1.4. For further details please contact DNV.

10 Chapter 10 - References and Definitions

10.1 References

10.1.1 DNV's Rules for Ships, current edition, including Part 5 Chapter 6 "Fishing Vessels".

10.1.2 DNV's Standards for Certification, Series No. 2 Approval Schemes, No 2.21 "Craft," Dated April 2010.

10.1.3 46 CFR Chapter 1 (10-1-10 edition) part 175.120 to 175.540
46 CFR Part 28 Applicable to Fishing Vessel Safety

10.1.4 Others as mentioned in the text of these rules which can be found at
http://exchange.dnv.com/servicedocuments/dnv

10.1.5 IMO Documents, such as
- Torremolinos International Convention, including later Protocols
- Code of safety for fishermen and fishing vessels, 2005 (L>24 m)
- Voluntary guidelines for the design, construction and equipment of small fishing vessels, 2005

10.2 Units

In general, Metric (SI) units are use throughout this document. However, in some places U.S. units are added for convenience. In case of discrepancies, the Metric units will prevail.

10.3 General Terminology, Definitions, and Abbreviations

Builder: Signifies the party contracted to build a vessel in compliance with the Society's rules.

Certificate: A document confirming compliance with the Society's rules or with other rules and regulations for which the Society has been authorized to act.

Certification: A service confirming compliance with applicable requirements on the date that the survey was completed.

Class: Class is assigned to and will be retained by vessels complying with applicable requirements of the Society's rules.

Classification: A service which comprises the development of independent technical standards for vessels - the rules, and to verify compliance with the rules throughout the vessels' life.

Condition of Class (CC): Constitutes a requirement that specific measures, repairs or surveys shall be carried out within a specific time limit in order to retain class.

Customer: Signifies the party who has requested the Society's service. See also *Owner.*

Designer: Signifies a party who creates documentation submitted to the Society for approval or information.

Flag administration: The maritime administration of a vessel's country of registry.

Guidance notes: Contain advice which is not mandatory for the assignment or retention of class, but with which the Society, in light of general experience, advises compliance.

Main functions in the context of class are:

- strength
- weathertight and watertight integrity
- power generation
- propulsion
- steering
- drainage and bilge pumping
- ballasting
- anchoring.

Manufacturer: Signifies the entity that manufactures the material or product, or carries out part production that determines the quality of the material or product, or does the final assembly of the product.

Memorandum to Owner (MO): Constitutes information related to the vessel, its machinery and equipment or to rule requirements. An MO will be issued in relation to information that does not require any corrective action or survey.

Owner: Signifies the registered owner or manager of the vessel or any other organization or person who has assumed the responsibility for operation of the vessel and who on assuming such responsibility has agreed to take over all the duties and responsibilities.

Plan approval: Signifies a systematic and independent examination of drawings, design documents or records in order to verify compliance with the rules or statutory requirements. Plan approval will be carried out at the discretion of the Society, which also decides the extent and method of examination. See also 3.5.

Quality system: Signifies both the quality management system and established production and control procedures.

Review: Signifies a systematic examination of drawings, design documents or records in order to evaluate their ability to meet requirements, to identify any problems and to propose necessary actions.

Rules: In the context of DNV rules for Domestic Classification of U.S. Fishing Vessels, see 1.1.1.

Society: See the Preamble to these rules (page 3).

Survey: Signifies a systematic and independent examination of a vessel, materials, components or systems in order to verify compliance with the rules and/or statutory requirements. Surveys will be carried out on the vessel, at the construction or repair site as well as at sub-suppliers and other locations at the discretion of the Society, which also decides the extent and method of control.

Tentative rules: Provisional requirements and/or guidelines to which the Society reserves the right to make adjustments in order to obtain the intention reflected in the rules.

Symbol	**Unit**	**Description**
L_{OA}	m(f)	Length overall; the horizontal distance of the hull between the foremost part of the stem and the aftermost part of the stern, excluding fittings and attachments.
L	m(f)	Rule length, taken as the greater of 96% of L_{WL}, and L_{PP}
L_{WL}	m (f)	Length of hull along waterline measured at the foremost intersection of the stem with the flotation plane and the aftermost intersection of the hull and the flotation plane. Generally taken at 85% of D measured from keel.
L_{PP}	m(f)	Length between perpendiculars
B	m(f)	Maximum beam of hull measured on the outside of the hull shell.
B_{WL}	m(f)	Beam of hull in the waterline. For catamarans: sum of waterline beam for both hulls
s	m(f)	Stiffener spacing - In fore and aft body, the spacing is to be measures along the plating
s_s	m	Standard frame spacing = 0.48 + 0.002L (m)
T	m(f)	Maximum draught of hull in fully loaded condition.
D	m(f)	Depth, measured as the vertical distance between the sheer line at the half-length of the waterline and the lowest point of the keel.
Δ	g(lb.)	Displacement in fully loaded condition.
l	m(f)	Stiffener span
V	knots	Maximum speed.
β	°	Deadrise angle is the angle of the bottom from the horizontal measured athwartship at a specific position.
LCG	m(f)	Longitudinal position of the center of gravity from a chosen datum.
VCG	m(f)	Vertical position of the center of gravity from a chosen datum.
RM	Nm	Righting moment.
GM	m(f)	Transverse metacentric height.
GZ	m(f)	Righting lever = righting moment (Nm)/(mass (kg) x 9.806).
F.P. or FP		Forward perpendicular; at the fore side of the stem at the deepest operating waterline
Freeboard deck Working deck		The lowest complete deck above the deepest operating waterline from which fishing is undertaken
Decked vessel		Vessel with deck that can be closed weathertight from stem to stern uninterrupted by other than a strong superstructure or a cockpit so designed that shipping sea will not fill spaces below deck.
Open vessel		Vessel that is not a decked vessel.
Flooded vessel		A flooded vessel is a vessel in a condition in which it cannot be filled with more water.
Superstructure		Decked structure on the freeboard deck, extending from side to side of the vessel or with the side plating not inboard of the shell plating more than 4% of the breadth (B).
Deckhouse		Decked structure above the strength deck with the side plating being inboard of the shell plating more than 4% of the breadth (B).
Long deckhouse		Deckhouse having more than 0.2 L of its length within 0.4 L amidships.
Short deckhouse		Deckhouse not defined as a long deckhouse.
Mean freeboard F	mm(in)	$F = (f_f + f_m + f_a)/3$
f_f	mm(in)	Freeboard measured at extreme forward end.

f_a	mm(in)	Smallest freeboard measured at extreme aft end
f_m	mm(in)	Freeboard measured at $L_H/2$.
Headroom	m(f)	Vertical distance between top of compartment floor and underside of the deck beam or deck head
Readily accessible		Capable of being reached for operation, inspection or maintenance without the use of tools or the removal of any vessel structure or any item of portable equipment.
Accessible		Capable of being reached for operation, inspection or maintenance without the removal any permanent vessel structure.
M	kNm	Maximum longitudinal bending moment.
Z	$cm^3(in^3)$	Section modulus of hull girder. May also be used for section modulus of girders or stiffeners.
W	cm^3	Section modulus (used in PART V)
Manufacturer		The entity putting the product on the market.
OCMI		U.S. Coast Guard term referring to the Officer in Charge of Marine Inspection
Girders		A collective term used for primary supporting members.
Ex		European Union Hazardous Locations Certification
Industry accepted standard		Generally to include certification by DNV, or manufacturers' documentation of the materials or component to include a written certificate confirming construction to a pre-existing approval standard, suitable for marine applications, from a recognized third party inspection or classification society. May also include accepted requirements or industry standards followed by recognized fishing vessel builders in the U.S.
f_1		Material factor. f_1=1.0 for Normal Strength steel. For other materials, including High Strength steel, contact DNV.

Note: Technical or other Chapter Specific definitions will appear in the Section to which they are related.

PART II – ARRANGEMENT AND STABILITY; WATER- AND WEATHERTIGHT INTEGRITY

1.0 Chapter 1 – Arrangement

1.1 Documentation

1.1.1 **Documentation Required – Drawings**

a) General Arrangement
- Engine and machinery
- Tanks and pressure vessels
- Sea chests

b) Steering, shafting and propeller
c) Body/lines plan
d) Freeboard/weathertight integrity plan
e) Vents, sounding pipes and overflows
f) Desk Machinery, anchor and winches
g) Arrangement of fishing gear and rigging
h) Lifesaving Equipment
i) Escape routes

1.1.2 **Documentation Required – Specifications**

a) Stability Booklet, or similar calculations
b) All relevant manufacturers data, such as
- Specifications
- Certifications
- USCG approvals
- Type Approvals
- Any other industry accepted standard documentations

1.1.3 See Part I Chapter 3, 3.5 for other documentation and calculations.

1.2 General

1.2.1 **Bulkheads**

a) Vessel covered by these rules should be arranged with at least three transverse watertight bulkheads, of which one shall be a collision bulkhead with minimum distance 0.05L from forward perpendicular (exceptions for locations of collision bulkhead can be made after a design review by DNV). The number of bulkheads assumes that the engine room is located aft; in other cases the number will be reconsidered.

b) Watertight bulkheads shall be carried up to freeboard (bulkhead) deck. However, with the exception of the collision bulkhead, the remaining watertight bulkheads may end at first weathertight deck above waterline based on special consideration of watertight division and integrity of the hull.

c) Engine compartment and cargo hold are to be separated from each other and from rest of the hull by watertight bulkheads. Minor steps or recesses in the bulkhead may be accepted.

d) With the exception of the collision bulkhead, doors and hatches in watertight bulkhead may be accepted, provided watertight closing devices are provided. The strength is to be equivalent to the surrounding bulkhead structure, and the doors or hatches are normally to be kept closed.

e) Small openings for penetrating pipes and electrical cables shall be sealed and arranged in the uppermost part of bulkheads.

1.2.2 **Accommodation**

Accommodation areas shall be without sharp corners and protruding parts and shall not be made of material which may break into dangerous fragments. It shall not contain unshielded, high temperature areas, high pressure or rotating items, and shall not contain operating controls located in a way to be impeded by persons during normal and emergency conditions.

1.2.3 **Ventilation**

a) Accommodation spaces shall have HVAC or ventilation systems, corresponding to the area of operation, to provide an acceptable level of comfort for all persons onboard.

b) Heating, cooking and similar installations shall have separate ventilation.

c) Inlets and outlets of ventilation shall be well separated from engine exhausts.

d) All compartments, holds and void spaces shall normally have natural ventilation.

f) Any space intended for flammable liquids etc. shall have separate ventilation.

1.2.4 **Sanitary**

All vessels shall normally be arranged with basic sanitary facilities (shower, toilet and wash basin). All Marine Sanitation Devices (MSDs) shall be in compliance with U.S. Coast Guard requirements.

1.2.5 **Exit, Passages, etc.**

a) All accommodation, and machinery-spaces that are possible to enter, shall normally be arranged with two exits, for which one may be an emergency exit. The exits shall be located as far as possible from each other, and be suitable to use in an emergency situation.

b) Width of passages shall be minimum 710 mm (28 in) but may be reduced to 600 mm (24 in) for spaces not normally used.

c) Accommodation for maximum 4 persons may be accepted with only one exit if this cannot be blocked in case of fire or other emergency situation and if it leads directly to open deck.

1.2.6 **Emergency Exit**

The emergency exit can be an approved hatch, door or window complying with the following:

- minimum light opening 500 x 500 mm (20 x 20 in) , or diameter 500 mm (20 in)
- easy access with fixed step, ladder and handholds as necessary
- clearly marked and with appropriate instructions for use.
- readily opened from both sides without tools in daylight and dark
- direct access to open deck, or via short passages without any lockable door.

1.2.7 **Emergency Light**

Emergency light is to be arranged for accommodation spaces and exits. See also Part V, Chapter 5.4.

1.2.8 **Wheelhouse**

The design and layout of the wheelhouse shall allow the crew to perform their duties without difficulty, fatigue or loss of concentration.

1.2.9 **Field of Vision**

a) The view of the sea surface from the operating station when seated, shall not be obscured by more than two vessel length forward of the bow to 90° on either side irrespective of the vessel's draught and trim.

b) Blind sectors shall be as few and as small as possible, and not adversely affect the keeping of a safe lookout from the operating station.

1.2.10 ***Reserved***

1.2.11 **Deck Arrangement**

Masts, rigging, superstructures, deckhouses and other items on deck on vessels intended for service in areas with below freezing temperatures are to be so designed and arranged that excessive accumulation of ice is avoided.
The rigging is to be kept at a minimum, and the surfaces of superstructures and other erections are to be as even as possible and free from projections and irregularities.

<<<<Guidance Note>>>>

Rigging and other items on deck should be arranged to minimize tripping hazards. Non-slip paint should be used as appropriate.

<<<<End Guidance Note>>>>

1.2.12 **Forecastle**

This section is required for vessels with overall length 24 m (79 ft.) or above; recommended for vessels below 24 m (79 ft.).

a) Fishing vessels are to have a forecastle if the sheer in the forebody is less than 1.5 times standard sheer established by the International Convention on Load Lines, 1966.

b) The length of the forecastle is not to be less than 0.07 L, and the mean height is not to be less than 1.5 m (5 ft.).

c) The forecastle is to be closed. When the length of the forecastle is greater than 0.07 L, the surplus part may be open if fitted with freeing ports according to the International Convention on Load Lines, 1966.

d) The required bow height is defined as the vertical distance at the forward perpendicular from the loaded waterline to the top of the exposed deck at side and given by

$$H_B = 56L\left(1-\frac{L}{500}\right)\frac{1.36}{C_B+0.68} \quad (mm)$$

C_B = Block coefficient at loaded waterline, or 0.5 if C_B is not known.

2.0 Chapter 2 - Stability, Water- and Weathertight Integrity

2.1 General

Mandatory US requirements are to be followed as applicable.

<<<<*Guidance Note*>>>>

46 CFR Part 28 contains several mandatory requirements that are not specifically covered by these rules. One such example is 46 CFR Part 28 Subpart E (for instance unintentional flooding/damage stability). Another may be Subpart G, concerning Aleutian Trade Act Vessels.

<<<<*End Guidance Note*>>>>

It is the responsibility of the builder to document that such applicable requirements are met. See also these rules Part I, Chapter 3, item 3.5.

2.2 Freeboard

US Fishing Vessels 24 m (79 ft.) or more overall in length are required to have a load line assigned. For such vessels, the International Load Line Convention, as ratified by the US, will determine the freeboard and all associated requirements.
The following requirements therefore apply to vessels under 24 m (79 ft.) overall in length which are not issued a load line certificate by or on behalf of the USCG.

a) The freeboard f_m shall at any point along the freeboard deck be at least $f_m = 0.025L$.

b) Where a vessel is fitted with bulwarks of at least 1 m (39 in), extending not less than 15 percent of the length aft of FP, the minimum bow height of the freeboard deck above the maximum operating draft at FP should not be less than
$f_f = 0.75 + 0.0275L$ m ($f_f = 2.5 + 0.0275L$ ft.)

c) Where the bulwark height is less than 1 m (39 in), the minimum bow height is to be increased accordingly.

d) Freeboard at FP may, in cases where a watertight forecastle is fitted that extends at least 0.07L aft of FP, be measured to the top of the forecastle deck plating. See also 1.2.12.

e) The minimum freeboard at AP should not be less than
$f_a = 0.24 + 0.0267L$ m ($f_a = 0.75 + 0.0267L$ ft.)

f) Draught marks are to be fitted on the sides at bow, midship and stern corresponding to the approved draught. The marks shall be permanent, and be painted in contrasting colors.

2.3 Stability

2.3.1 General

a) Enclosed superstructure, deckhouses and trunks may be included as buoyancy elements provided they have approved strength and closing appliances.

b) A sketch of buoyant volumes with their openings and closing appliances is to be included in the stability booklet. This sketch is to include instructions on operation of the closing appliances (example: "To be kept closed at sea").

c) Operational information critical to the stability of the vessel should be included in the stability booklet. Examples include, but are not limited to, general precautions against capsizing, procedures related to severe weather conditions, precautions to prevent unintentional flooding, as well as information on safe use of cranes and fishing gear.

d) If any of the closing appliances referred to in b) have to be left open periodically during fishing, the opening(s) are to be considered as flooding points in the stability calculations. If the angle of flooding is less than 30°, section 2.3.6 applies.

<<<<Guidance Note>>>>

The internal opening of a garbage chute which is operated in such a way that only one of the two required closing devices is open at a time need not be considered as a flooding point.

<<<<End Guidance Note>>>>

2.3.2 Stability Criteria

a) The area under the righting lever curve (GZ curve) is not to be less than 0.055 meter-radians up to $\theta = 30°$ angle of heel and not less than 0.09 meter-radians up to $\theta = 40°$ or the angle of flooding θ_f if this angle is less than 40°. Additionally, the area under the righting lever curve (GZ curve) between the angles of heel of 30° and 40° or between 30° and θ_f , if this angle is less than 40°, should not be less than 0.03 meter-radians.

b) The righting lever GZ is to be at least 0.20 m at an angle of heel equal to or greater than 30°.

c) The maximum righting arm should occur at an angle of heel not less than 25°.

<<<<Guidance Note>>>>

In case the vessel's characteristics render compliance with the above criterion impracticable, the alternative criteria as given in DNV's Rules for Ships, Pt.3 Ch.3 Sec.9 D102 may be applied upon special consideration.

<<<<End Guidance Note>>>>

d) When calculating the heeling moment due to operation of lifting gear, winch, towing hook etc., a dynamic factor of 1.4 is normally to be used to include effects from wind, waves etc.

e) The initial metacentric height is not to be less than 0.35 m (14 in) in any operating condition.

f) The metacentric height GM in light ship condition is to be positive.

g) Fishing vessels in the length range between 24 m (79 ft.) and 45 m (148 ft.) are to comply with the weather criterion referenced in DNV's Rules for Ships, Pt.3 Ch.3 Sec.9 D201, but the values of wind pressure are to be taken from Table F1.

Table F1 Wind pressure						
h(m)	1	2	3	4	5	6 and over
P (N/m^2)	316	386	429	460	485	504

"h" is the vertical distance from the center of the projected vertical area of the vessel above waterline, to the waterline.

2.3.3 **Loading Conditions**

a) Compliance with the stability criteria shall be documented for the following standard loading conditions:

- Departure for the fishing grounds with full fuel, fresh water, stores, ice, fishing gear, etc.
- Departure from the fishing grounds with full catch, at maximum draught and no more than 30% fuel, fresh water and stores
- Arrival at home port with full catch and 10% fuel, fresh water and stores remaining
- Arrival at home port with 20% of full catch and 10% fuel, fresh water and stores remaining
- At fishing grounds with maximum catch on deck, hold empty and 50% fuel, fresh water and stores remaining (if consistent with fishing method)

b) Special loading conditions associated with a change in the vessel's mode or area of operation which affect the stability, are to be considered.

c) If water ballast must be filled between departure and arrival in order to meet the stability criteria, a loading condition is to be included showing when the water ballast must be taken on board. The condition is to show the situation just before ballasting, with the maximum free surface moments of the ballast tank(s) included.

d) Allowance for the weight of wet fishing net and tackle on deck, is to be included if applicable.

e) Allowance for ice accretion according to 2.3.4 must be shown in the worst operating condition in the stability booklet, if consistent with area of operation.

f) Homogeneous distribution of catch in all holds, hatch coamings and trunks is to be assumed, unless this is inconsistent with practice. (Volumetric center of gravity and identical specific gravity for all holds available for catch.)

g) Catch on deck is to be included in the loading conditions showing departure from fishing grounds and arrival at port, if this is consistent with operation.

h) Free surface effect of catch is to be included, if relevant.

i) Free surface effect of water in fish bins is to be included in loading condition at fishing grounds, if relevant.

j) Free surface effect of RSW tanks is to be included, if this is consistent with operation.

k) In all loading conditions, full fishing gear and equipment is to be assumed.

2.3.4 **Icing Considerations**

The calculation of weight and center of gravity of the ice accretion, is to be based on the following assumptions:

- 30 kg per square meter on exposed weather decks and gangways
- 7.5 kg per square meter for projected lateral area of each side of the vessel above the water plane
- The projected lateral area of discontinuous surfaces of rail, sundry booms, spars (except masts) and rigging of vessels having no sails and the projected lateral area of other small objects should be computed by increasing the total projected area of continuous surfaces by 5% and the static moments of this area by 10%.

<<<<Guidance Note>>>>

Vessels intended for operation in areas where ice accretion is known to occur should be
- *Designed to minimize the accretion of ice*
- *Equipped with suitable means for removing ice*

<<<<End Guidance Note>>>>

2.3.5 **Roll Reduction Tanks**

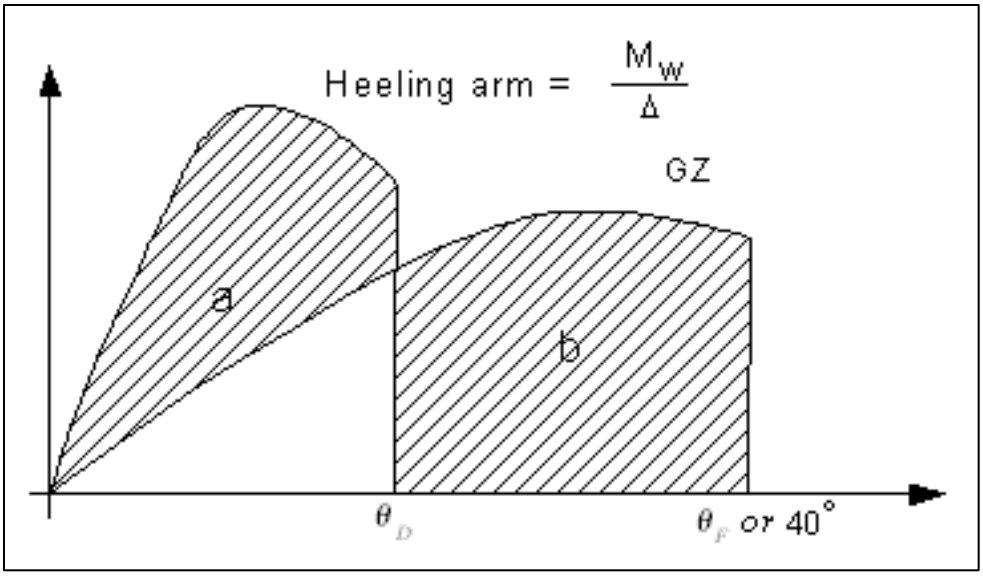
a) When equipped with roll reduction tanks, the reduction in stability due to the effect of these tanks is to be allowed for in the loading conditions.

b) If the roll reduction tanks cannot be used in all conditions of loading, an instruction on the use of these tanks and corresponding limit conditions are to be included in the stability booklet. These limit conditions are to show the stability of the vessel just before emptying the roll reduction tanks.

2.3.6 **Water on Deck and in Compartments Temporarily Open to the Sea**

a) Accumulation of water on deck is to be assumed if the requirements of freeing port area (See 2.4 “Openings and Closing Appliances”) are not fully met, or if the design of the weather deck is such that water may be trapped. The stability calculations shall take the effect of this water into account.

b) If hatches or similar openings have to be left periodically open during operation, the stability calculations shall take the effect of water in the open compartment(s) into account according to the requirements of c), d) and e) below, provided that the angle of downflooding for the critical opening is less than 30°.



Water on Deck Criterion

c) The ability of the vessel to withstand the heeling effect due to the presence of water on deck, is to be demonstrated by a quasi-static method. With reference to figure above, the following criterion is to be satisfied with the vessel in the worst operating condition:

- Area «b» shall be equal to or greater than area «a».
- The angle that limits area «b» shall be taken as the angle of downflooding θ_F or 40°, whichever is less.

d) The value of the heeling moment M_w (or the corresponding heeling arm), due to the presence of water on deck shall be determined assuming that the deck well is filled to the top of the bulwark at its lowest point (or the flooding point of the open compartment). The vessel is to be heeled up to the angle at which this point is immersed θ_D where the heeling moment M_w (or the corresponding heeling arm), shall be terminated.

e) When calculating M_w the following assumptions shall be made:

- At the beginning the vessel is in the upright condition
- During heeling, trim and displacement are constant and equal to the values for the vessel without the water on deck
- The effect of freeing ports shall be ignored.

2.3.7 **Onboard Cranes**

a) The effect on the stability of cranes when used for fishing operations, is to be considered in the stability calculations in accordance with the requirements given in b), c) and d) below..

b) The maximum possible crane heeling moment is to be assumed. The following shall be considered in the calculation of this moment:

- Combination of safe working load on hooks and crane radius
- Weight and position of boom relative to crane axis
- Two cranes (or more) working in combination (if consistent with practice).

c) When the effect of the crane heeling moment is checked, the vertical center of gravity of the loading condition shall be calculated with load on crane hooks. When the static heeling angle exceeds 5°, the heeling lever is to be drawn in the GZ diagram for the critical loading condition(s). Cranes are not to be used at sea, unless it can be demonstrated that the residual stability is sufficient.

d) Information on operational limitations on use of cranes, if any, is to be included in the stability booklet. This could include limitations on allowable load on hooks for certain conditions of loading. The maximum heeling moment calculated according to b) above shall be stated in the stability booklet.

2.3.8 **Forces from fishing Gear**

a) When special arrangement of the fishing gear (e.g. trawls or purse seines) results in significant forces on the vessel with impact on the stability, this is to be considered in the stability calculations.

b) Significant changes to fishing gear impacting stability shall be reported to the Society and stability calculations are to be performed to maintain the vessel's Classification Certificate.

2.4 Openings and Closing Appliances

2.4.1 **Coaming and Sill Height, Closing Appliances, Freeing Ports**

a) Coaming and sill heights, closing appliances, freeing port areas, air pipes, ventilators, sanitary discharges etc. shall be in accordance with the requirements in DNV's Rules for Classification of Ships Pt.3 Ch.3 Sec.6, except as otherwise specified in this subsection.

b) The height above deck of sills in those doorways, in companionways, erections and machinery casings which give direct access to parts of the deck exposed to the weather and sea shall be at least 600 mm (23.6 in) on the freeboard deck and at least 300 mm (11.8 in) on the superstructure deck subject to special consideration, where operating experience has shown justification, these heights, except in the doorways giving direct access to machinery spaces, may be reduced to not less than 380 mm (14.9 in) and 150 mm (5.9 in), respectively.

c) Weathertight doors leading to spaces below freeboard deck and to enclosed superstructure included as buoyant in the stability calculations, are to be positioned as close to the vessel's centerline as possible. Weathertight doors are to have a standard equivalent to ISO 6042. Spraytight doors of a standard equivalent to ISO may be accepted as weathertight doors on vessels with service restriction **R4** and in general for doors in bulkheads in enclosed superstructure.

d) The height above deck of hatchway coamings shall be at least 600 mm (23.6 in) on exposed parts of the freeboard deck and at least 300 mm (11.8 in) on the superstructure deck.

e) Where justified by operating experience, and subject to special consideration, the height of the hatchway coamings may be reduced, or the coamings omitted entirely, provided that the safety of the vessel is not thereby impaired. In this case, the hatchway openings shall be kept as small as practicable and the covers be permanently attached by hinges or equivalent means and be capable of being rapidly closed and battened down, or by equally effective arrangements.

f) Flush deck hatches used for catch of fish should normally be led to a tank or a watertight fish bin. The closing arrangement of the hatches is to be operated from deck.

g) Hatch covers are to be weather- or watertight, with gaskets and necessary securing devices. For hatch covers of more than 4 m^2, small hatch covers shall be installed as close to the vessel's centerline as possible for use during operation. Such hatch covers are to have securing devices also at the hinged side. Hinged hatch covers are to be securable in open position.

h) Coaming height and sill height for hatches and doors on working deck in enclosed superstructure and deckhouses where water is used in the working process are not to be less than 100 mm (4 in).

i) Closing appliances need not be fitted to ventilators the coamings of which extend to more than 3.4 m (11.15 ft.) above the freeboard deck or more than 1.7 m (5.58 ft.) above the superstructure deck.

j) Below the freeboard deck and in enclosed superstructure on freeboard deck, side scuttles with hinged deadlights are to be used.

k) Side-scuttles and windows may be accepted without deadlights in side and aft bulkheads of deckhouses located on or above the freeboard deck if satisfied that the safety of the vessel will not be impaired.

l) Side-scuttles and windows prone to be damaged by fishing gear shall be suitably protected.

m) Side scuttles in ship sides, including outboard side of enclosed superstructure and deckhouses at ship sides, are not to be closer to the loaded waterline than 500 mm (20 in) . Such side scuttles shall be equipped with hinged deadlights. Side scuttles closer to the loaded waterline than 1000 mm (40 in) shall not be possible to open.

n) The freeing port area on each side of net bins and other short wells on deck with length less than 5 m (16.4 ft.) , may be calculated using the following formula:

$$A = 0.175\ l\ (m^2)$$

l = length of well (m)

In short wells of less than 3 m (9.8 ft.), the freeing port area may be specially considered.

Covers of freeing ports are to be non-closeable and hinged at upper edge.

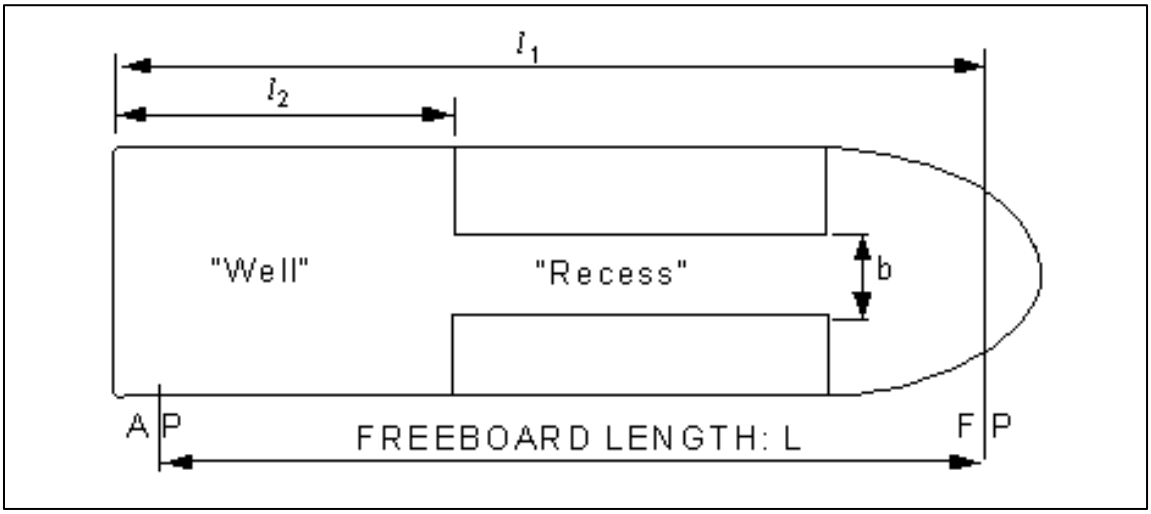


Figure 1.0 Parameters used for calculation of freeing port area

o) For non-watertight fish bins, a drainage system is required in order to prevent flooding of the working deck area.

p) Ordinary freeing ports in high bulwarks (more than 1m or 39 in. in height), or in sides of open superstructure, are not considered as sufficient for drainage of exposed freeboard deck (may be accepted for vessel with service notation **RE**). Open superstructure such as open forecastle, separate walls at side or other similar constructions are therefore not acceptable, unless the stability requirements of 2.1.7 for water on deck are complied with, or if sufficient drainage is provided according to 2.2.1q).

q) For vessels where the sea may enter over the stern and flood the deck into a superstructure which is open at the aft end, the freeing port area on each side is not to be less than required by the following formulas:

$$A_{Well} = \left((0.07 l_2) + \frac{0.004(h - 1.2) l_2}{0.1}\right) y_1 y_2 \quad (m^2)$$

Where the length of the bulwark in the well is 20 m (65.6 ft.) or less

$$A_{Well} = \left((0.7 + 0.035 l_2) + \frac{0.004(h - 1.2) l_2}{0.1}\right) y_1 y_2 \quad (m^2)$$

$$A_{Recess} = \left[(0.07 l_1) \frac{b}{l_1} \left(1 - \left(\frac{l_2}{l_1}\right)^2\right)\right] y_1 y_2 \quad (m^2)$$

l_1 need in no case be taken as greater than 0.7 L.

y_1 = 0.5 for superstructure deck
= 1.0 for freeboard deck

y_2 = 1.5 for no shear
= 1.0 for suitable shear applied

h = average height of bulwark aft of the open superstructure.

Other parameters are defined by Fig. 1.0 above.

r) Freeing ports over 300 mm (12 in) in depth shall be fitted with bars spaced not more than 230 mm (9 in) nor less than 150 mm (6 in) apart, or provided with other suitable protective arrangements. Freeing port covers, if fitted, shall be of approved construction. If devices are considered necessary for locking freeing port covers during fishing operations they shall be easily operable from a readily accessible position.

s) Pound-boards and means for stowage of the fishing gear shall be arranged so that the effectiveness of freeing ports will not be impaired. Pound-boards shall be so constructed that they can be locked in position when in use and shall not hamper the discharge of shipped water.

t) In vessels intended to operate in areas subject to icing, covers and protective arrangements for freeing ports shall be capable of being easily removed to restrict ice accretion. The size of openings and means provided for removal of these protective arrangements are to be considered.

2.5 Weathertight Integrity

2.5.1 **General**

a) Small openings for wire, chain, scuppers etc., will be considered as closed if submerged at angle of heel larger than 30º.

b) Openings to spaces below freeboard deck, or to other spaces included as buoyancy in stability calculations, shall be fitted with weathertight closing appliances.

c) Closing appliances shall be built with same strength as the surrounding structure and be arranged to provide safety against sea impact.

d) Closing appliances shall as a minimum include gasket and two closing devices in addition to hinges.

2.5.2 **Doors**

a) It shall be possible to operate doors from either side of the bulkhead in which they are installed

b) The sill height of door openings to spaces below freeboard deck shall be at least 380 mm (15 in). For doors located at least 380 mm (15 in) above freeboard deck, a reduced height of sill may be accepted, but normally not less than minimum 150 mm (6 in).

c) Arrangement for removable washboard replacing a sill may be accepted based on special consideration.

2.5.3 **Ports and Ramps**

a) Ports and ramps in freeboard above weathertight deck may be accepted. Water- tightness shall be arranged with gasket and hinges/clamps with spacing not exceeding 300 mm (12 in).

b) The arrangement for safety of operation, stop arrangement and any indicators etc. shall be submitted for approval.

c) The lower edge of openings shall not be less than 200 mm (8 in) above deepest waterline.

2.5.4 **Ventilation**

a) Ventilation openings shall be arranged to avoid flooding of the vessel and normally have minimum height 600 mm (24 in) above freeboard deck.

b) Ventilation openings shall normally not be immersed at heel angle smaller than 50º.

2.5.5 **Air Pipes**

a) Air pipes are defined as openings for ventilation normally not exceeding an area equivalent to a diameter of 50 mm (2 in) .

b) Air pipes shall be arranged with non-return valve or goose necks to prevent water ingress.

c) The height of air pipes shall normally not be smaller than 600 mm (24 in) above the freeboard deck.

d) Air pipes shall be protected from damage from work on deck.

2.5.6 **High Water Alarms**

A visual and audible alarm is to be provided at the operating station to indicate high water level in normally unmanned spaces, such as lazarette and machinery space bilges.
For requirements to bilge systems, see Part 4 Chapter 4.

2.5.7 **Windows**

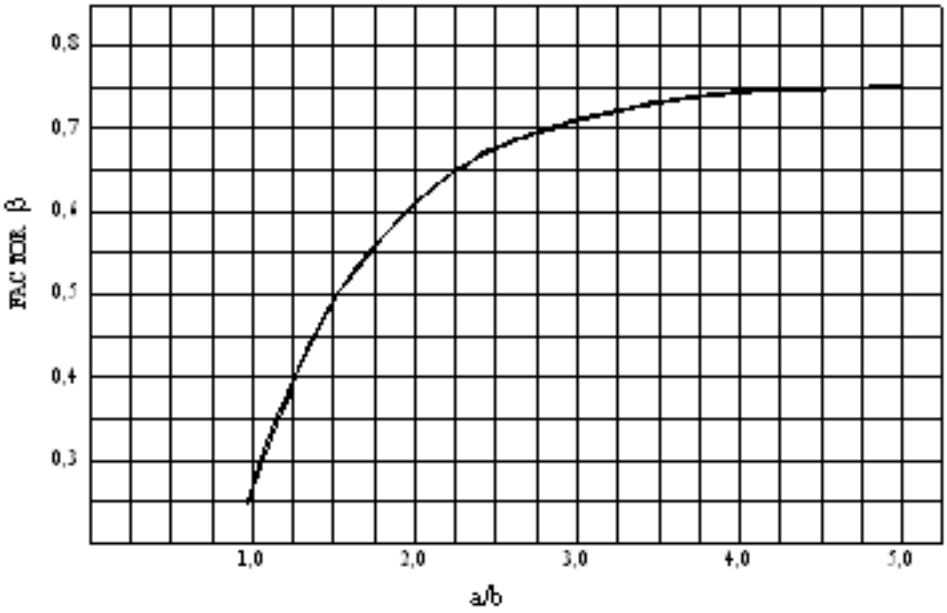
a) Windows in accommodation spaces may be fabricated from thermally or chemically toughened glass or polycarbonate. Windows shall not fracture in fragments that can easily cause human injury.

b) Windows shall be fitted in rigid frames and secured from being pressed in. A rubber gasket is acceptable if the window cannot be pressed in and the glass thickness is increased by 20%.

c) The minimum thickness (mm) of windows shall be calculated according to the following formula:

$$t = \frac{b}{K}\sqrt{\beta P}$$

P = design pressure at the location of the window
B = according to the figure below
a = the larger dimension of the window opening
b = the smaller dimension of the window opening
K = 190 for glass
= 160 for polycarbonate.



For windows placed above positions exposed to sea-load the thickness may be reduced by 25%.

Horizontal windows (skylights) in positions exposed to impact from operation are subject to special consideration.

PART III – MATERIALS AND MANUFACTURING

1.0 Chapter 1 – General Requirements

1.1 Steel

1.1.1 Structural steel materials shall be wieldable and meet the specifications outlined in "DNV Rules for Classification of Ships" Part 2 Chapter 2 Section 1.

1.1.2 For rolled steel, the following table sets forth the standard DNV requirements for chemical composition and mechanical strength for normal strength steel:

Table B1 Chemical composition limits [1] and deoxidation practice for normal strength steel

Grade	*C* [2]	*Si*	*Mn* [2]	*P*	*S*	*Al*	*Deoxidation practice*
NV A	0.21[3]	0.50	Min. 2.5 x C	0.035	0.035	-	For t ≤ 50 mm: Any method except rimmed steel [4]
							For t > 50 mm: Killed
NV B	0.21	0.35	Min. 0.80 [5]	0.035	0.035	-	For t ≤ 50 mm: Any method except rimmed steel
							For t > 50 mm: Killed
NV D	0.21	0.10-0.35	Min. 0.60	0.035	0.035	-	For t ≤ 25 mm: Killed
						Min. 0.020 [6]	For t > 25 mm: Killed and fine grain treated
NV E	0.18	0.10-0.35	Min. 0.70	0.035	0.035	Min. 0.020 [6]	Killed and fine grain treated

1) Composition in percentage mass by mass maximum unless shown as a range or as a minimum.
2) C + 1/6 Mn shall not exceed 0.40%.
3) Maximum 0.23% for sections.
4) Rimmed steel may be accepted for sections up to 12.5 mm thickness.
5) Minimum 0.60% when the steel is impact tested.
6) Total content. Acid soluble content, if determined instead, shall be minimum 0.015%.

Minimum Yield stress: 235 N/mm^2
Tensile strength: 400-520 N/mm^2
For requirements for delivery condition, elongation and impact toughness, see DNV "Rules for Classification of Ships" Part 2 Chapter 2 Section 1.

<<<<*Guidance Note*>>>>

Other structural steels may be accepted on a case by case basis, for instance ASTM A36/A36M.

<<<<*End Guidance Note*>>>>

1.1.3 Unless certified by DNV or another acceptable 3rd part certification body, structural steel material shall be delivered with a works certificate, issued by the manufacturer.

1.1.4 Each lot shall be marked with the manufacturers name, type designation, approval certificate reference, batch number and date of manufacture

1.1.5 Products lacking the certification specified in 1.1.3 above shall be subject to a product control testing verified by a recognized institution.

1.2 Aluminum

1.2.1 Aluminum alloy for marine use may be applied in superstructures, deckhouses, hatch covers, hatch beams and other local items.

1.2.2 In weld zones of rolled or extruded products (heat affected zones) the mechanical properties given for extruded products may in general be used as basis for the scantling requirements.

1.2.3 Welding consumables giving a deposit weld metal with mechanical properties not less than those specified for the weld zones of the parent material are to be chosen.

1.2.4 Aluminum structures grounding to steel hull are to be in accordance with DNV Ship Rules Pt.4 Ch.8.

1.3 Other Materials

For use of other materials please contact DNV. For use of aluminum or FRP in main hull strength elements in vessels with length less than 24 m (79 ft.), please see PART VII – "Appendices".

2.0 Chapter 2 – Metallic Materials, Machining, Welding and Joints

2.1 Steel Materials

2.1.1 General

Steel material shall be stored in suitable areas protected from water, salts, weather and excessive humidity, in order to minimize corrosion.

2.1.2 Welding

a) Welding of structural parts for which requirements are given by these rules shall be done by welders with approved certificate for the actual or similar material and method of welding.

- Welding procedures shall be approved by DNV.
- Welding electrodes shall be stored in a dry and clean place.
- Gas-shielded welding shall be performed indoors, or under conditions as approved by the DNV surveyor.
- Flat welding shall be used as far as possible
- The seams shall be cleaned and free from damaging paint, rust and dirt before welding.
- Shop primer used shall be of a type that is possible to weld without leaving any damaging effect to the strength of the welding (e.g. DNV type approved or with similar properties).
- Welds shall have a minimum throat thickness according to the following table:

Plate thickness mm (in)	Throat thickness, a mm (in)
< 4 (0.16)	2.0 (0.08)
4 – 6.4 (0.16 – 0.25)	2.5 (0.1)
6.5 – 8 (0.25- 0.32)	3.0 (0.12)
> 8 (0.32)	0.45 x thickness of thinnest plate

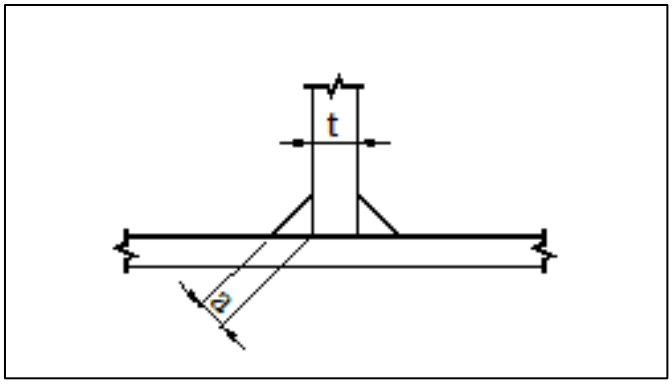


Figure III 2a - Throat thickness, a

Unless otherwise approved or required by these rules, the following items shall be welded with double side continuous fillet welding:

Continuous welding	Brackets for beams and other means of support
	Girders below waterline, and floors
	Foundations for engine(s), propulsion and equipment
	Keel and stem
	At ends of beams/stiffeners where intermittent welding is otherwise not permitted (see next item)

For intermittent welding, the weld length and spacing shall be according to the following table.

Thickness of plate: t mm (inches)	Minimum weld length: l mm (in)	Maximum spacing: e mm (in)
3 – 4.5 (0.12-0.18)	50 (2.0)	100 (4.0)
5 – 6.5 (0.2-0.26)	65 (2.6)	130 (5.2)
7 – 8.5 (0.28-0.33)	75 (3.0)	150 (6.0)
9 – 10.5 (0.35-0.41)	100 (4.0)	200 (8.0)

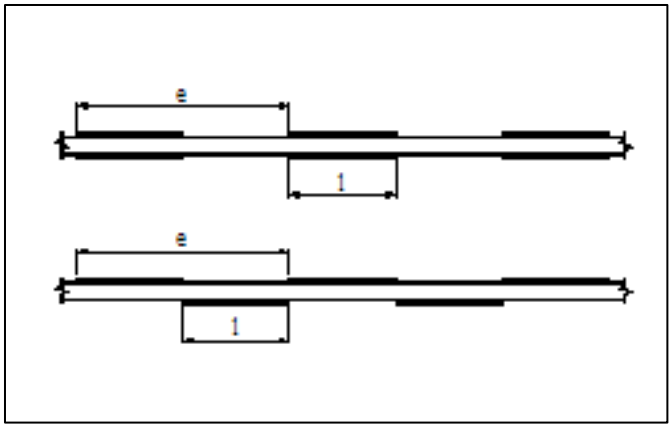


Figure III 2b - Intermittent welding

2.2 Welding of Aluminum (where use of aluminum is permitted; see Part III and IV)

a) Welding of structural parts for which requirements are given by these rules shall be done by welders with approved certificate for the actual or similar material and method of welding.

b) Welding procedures for aluminum can be referenced in Rules for Classification of Ships, Part 2 chapter 3 Section J, "Welding Procedures for Aluminum."

2.3 Welding of Dissimilar Metals

a) Welding of structural parts for which requirements are given by these rules shall be done by welders with approved certificate for the actual or similar material and method of welding.

b) For welding of dissimilar metals, builder shall reference an industry standard procedure and document material and weld process used.

PART IV – STRUCTURES

1.0 Chapter 1 - Design Principles

1.1 Application

1.1.1 This Part applies to fishing vessels with displacement hulls with overall lengths from 15 to 45 m (50 to 148 ft.) with speeds not exceeding 15 knots.

1.1.2 For vessels designs falling outside 1.1.1 above, please refer to Part I Chapter 1.2.

1.1.3 For structural arrangements not covered by this rule, or for unusual structural arrangement please see DNV's Rules for Ships. Contact DNV for further advice.

1.2 Documentation

1.2.1 **Plans and Particulars**

a) The following plans shall be submitted for approval:

- midship section including main particulars and maximum speed V
- profile and decks
- longitudinal and transversal stiffening members
- shell expansion and framing including openings
- watertight bulkheads and transom including openings and their closing appliances
- tank structure
- engine room structures including foundation for heavy machinery components
- aft peak structures
- forepeak structures
- superstructures and deckhouses including openings with sill heights and their closing appliances
- hatchways, hatch covers and ports including securing and tightening appliances
- propeller shaft brackets with their attachments to the hull
- appendages with their attachments to the hull
- rudder and rudder stock with details of bearings and seals
- arrangement and particulars of anchoring and mooring equipment.
- additional documentation may be required.

<<<<*Guidance Note*>>>>

Identical or similar structures in various positions are recommended covered by the same plan.

<<<<*End Guidance Note*>>>>

b) The following plans shall be submitted for information:

- general arrangement
- tank arrangements
- capacity plan
- body plan
- arrangement of cathodic protection.

c) Additional documentation required is listed in each appropriate section.

1.2.2 **Other Documentation and Strength calculations**

See Part I Chapter 3, 3.5.

2.0 Chapter 2 - Design Loads

2.1 General – Application

The design loads in this Part shall only be applied in association with the strength formulas given in this Part.

2.1.1 **Local Reinforcements**

Structure with local loads from cargo, fenders, deck-gears, foundations etc., shall be reinforced for the actual loads.

2.1.2 **Draught for Scantlings**

For fishing vessels with a draught not limited by any freeboard mark, or other operational limit regarding the maximum draft, the molded depth D instead of draught T is to be used when calculating the scantlings of strength members.

2.1.3 **Reductions for Service Restrictions**

For vessels with service restriction **R0**-**RE**, the dynamic load factors k_{sea}, k_t, k_d may be reduced by percentage as follows:

Service restriction	k_{sea} reduction
R0	No reduction
R4	40%
RE	50%

2.2 Design loads – General Considerations for Fishing Vessels

2.2.1 **Longitudinal strength**

The maximum longitudinal bending moment for vessel operating entirely in displacement mode shall not be less than: $M = 0.016 \cdot L_{WL}^{3} \cdot B_{WL}$ (kNm)

a) In no case shall the maximum longitudinal bending moment be less than 100 kNm.

b) The maximum longitudinal bending moment shall be applied to the central 25% of L with a linear reduction to zero at the fore and aft end of the vessel.

c) For vessels with service restriction **R0**-**RE**, the M value may be reduced as follows:

Service restriction	M reduction %
R0	No reduction
R4	12%
RE	15%

2.2.2 **Sea pressure on hull bottom and side**

Design sea pressure P_{sea} should be calculated using the formula below. The pressures correspond to scantlings draught equal to vessel depth.

P_{sea} $= (10 + k_{sea}) D$ (kN/m^2) at baseline (z = 0)
$= k_{sea} D$ (kN/m^2) at deck line
= linear interpolation based on z-coordinate between baseline and deck line
= minimum 5 (kN/m^2)

where:

D = vessel depth in meters measured at midship
k_{sea} = dynamic factor for sea pressures; for vessels without service restrictions k_{sea} shall be calculated as below

k_{sea} = bottom, at baseline (z=0)
3.5 D – at A.P
2.0 D – between 0.2-0.7L
5.0 D – at F.P

= side, at deck line (z=D at midships)
4.5 D – at A.P
3.0 D – between 0.2-0.7L
6.0 D – at F.P

= linear interpolation of k_{sea} values between A.P and 0.2L, and 0.7L and F.P.

2.2.3 **Design loads on decks and superstructures**

a) The design sea pressure acting on decks shall not be less than:

$P_d = k_d \cdot L + 4.5$ (kN/m^2)

where:

k_d = 0.2 for exposed main weather deck and superstructure deck forward of 0.25 L from FP
= 0.1 for exposed superstructure decks elsewhere.

b) The design load for accommodation decks and decks intended for cargo shall be:

$P_{dc} = (10+k_{dc})\ H$

where:

k_{dc}= 5 within 0.2L from F.P.
= 3 elsewhere
H = deck cargo in t/m^2
= 0.35 t/m^2 for accommodation decks (t = metric tonnes)

c) The design sea pressure on superstructures and deck houses shall not be taken less than given in the table below:

Position	p (kN/m^2)
Front bulkhead	0.3 L + 6
Sides and aft bulkhead	0.15 L + 3
Deck house roof, 1st tier	0.1 L + 3
Deck house roof, elsewhere	0.1 L + 1.5

2.2.4 **Design loads for bulkheads and tanks**

a) The design load for watertight bulkheads shall not be taken less than:

$P_{bh} = 10\ h_b \quad (kN/m^2)$

h_b = distance from load point to top of bulkhead

b) The design load for tanks for oil, freshwater, water ballast, etc. shall not be taken less than the greater of:

$p_t = (10 + k_t)\ h_s \quad (kN/m^2)$

where:

k_t = 5.0 in the forward area within 0.2 L from forward perpendicular (FP)
= 3.0 elsewhere

$p_t = 7\ h_p \quad (kN/m^2)$
$= 15 \quad (kN/m^2)$ minimum

h_s = vertical distance in meters from the load point to the top of tank or hatchway, excluding smaller hatchways
h_p = distance from load point to top of air pipe or filling pipe whichever is the greater.

2.2.5 **Design loads for deck equipment**

a) Design loads of deck equipment shall not be taken less than:

- 1.2 SWL for equipment intended for harbor use only
- 1.5 SWL for equipment intended for offshore use

where SWL is Safe Working Load

b) Higher design loads may be requested by DNV on a case-by-case basis.

3.0 Chapter 3 – Structural Design

3.1 Structural Arrangement

3.1.1 **Structural Design in General**

a) The vessel arrangement shall take into account:

- continuity of longitudinal strength members
- transverse bulkheads or strong webs
- web/pillar rings in engine room
- superstructures and deckhouses
- direct support
- transitions
- deck equipment support
- multi-deck pillars to be in line, as practicable
- external attachments, inboard connections.

b) Brackets are to extend to the nearest stiffener, or local plating reinforcement shall be provided at the toe of the bracket.

c) Generally, connections of outfitting details to the hull shall be such that stress concentrations are minimized and welding to highly stressed parts is avoided as far as possible.

d) Connections shall be designed with smooth transitions and proper alignment with other hull structural elements. Terminations are to be supported.

e) Knuckles are to be supported.

3.1.2 **Longitudinal Strength**

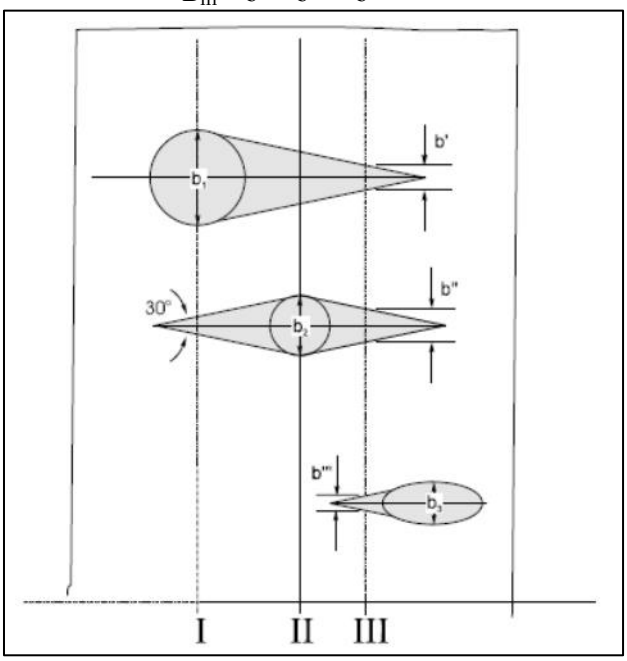
a) The section modulus amidships (Z) of hull girder shall not be less than:

$Z = 11.4\ M\ (cm^3)$
along the middle 25% of the length of the hull girder. Outside the middle part, the section modulus may be reduced linearly to zero at the fore and aft end of the vessel.

b) A section modulus lower than required by a), but not less than Z = 5.7 M, may be accepted after special consideration. Strength of the upper deck, bottom, and upper/lower parts of longitudinal bulkheads and ship side shall then be designed per DNV Ship Rules Pt.3 Ch.2.

c) The effective sectional area of continuous longitudinal strength members is in general the net area after deduction of openings. Superstructures which do not form a strength deck are not to be included in the net section. This applies also to deckhouses and bulwarks. The effect of openings is assumed to have longitudinal extensions as shown by the shaded areas in the figure below i.e. inside tangents at an angle of 30° to each other. Example of area to be deducted for transverse section III:

$B_{III} = b' + b'' + b'''$



3.1.3 **Bottom structures**

a) The bottom structure shall comply with the requirements given in Sections 3.2, 3.3, 3.4 and 3.6 below.

b) The local strength of the keel shall be sufficient to withstand loads in connection with dry-docking or the vessel being on a slipway.

c) Bottom structures may be longitudinally or transversely stiffened.

d) The longitudinals shall preferably be continuous through transverse members. If they are to be cut at transverse members, i.e. watertight bulkheads, continuous brackets connecting the ends of the longitudinal shall be fitted or welds shall be dimensioned accordingly.

e) Longitudinal stiffeners shall be supported by bulkheads and web frames.

f) Web frames are to be continuous around the cross section i.e. floors, side webs and deck beams are to be connected. Intermediate floors may be used.

g) In the engine room plate floors shall be fitted at every frame. Alternatively the bottom structure shall be arranged with sufficient stiffness to effectively support the main engine(s) and minimize vibration, following engine manufactures specifications.

h) Longitudinal girders shall be carried continuously through bulkheads or effectively supported at the ends.

i) A center girder shall be fitted for drydocking purpose if the external keel or bottom shape does not give sufficient strength and stiffness.

j) Openings shall not be located at ends of girders without due consideration being taken to shear strength.

k) Under the main engine, girders extending from the bottom to the top plate of the engine seating shall be fitted.

l) Engine hold-down bolts shall be arranged as near as practicable to floors and longitudinal girders.

m) In way of thrust bearing and below pillars additional strengthening shall be provided.

n) Manholes shall be cut in the inner bottom, floors and longitudinal girders to provide access to all parts of the double bottom. The vertical extension of lightening holes shall not exceed one half of the girder height. The edges of the manholes shall be smooth. Manholes in the inner bottom plating shall have reinforcement rings. Manholes shall not be cut in the floors or girders in way of pillars.

3.1.4 **Side structures**

a) The scantlings of side structures shall comply with the requirements given in Sections 3.2, 3.3 and 3.4 below, and Chapter 4 as appropriate.

b) The vessel's sides may be longitudinally or vertically stiffened.

c) The longitudinals at deck and bottom should be continuous through transverse members. If they are to be cut at transverse members, i.e. watertight bulkheads, continuous brackets connecting the ends of the longitudinal shall be fitted or welds shall be dimensioned accordingly.

d) Vertical side frames should be connected to floors and deck beams with well-rounded transitions or brackets.

3.1.5 **Deck structures**

a) The scantlings of deck structures shall comply with the requirements given in Sections 3.2, 3.3 and 3.4 below.

b) Decks may be longitudinally or transversely stiffened.

c) Longitudinals should be continuous through transverse members. If they are to be cut at transverse members, i.e. watertight bulkheads, continuity including end connections shall be ensured.

d) The plate thickness shall be such that the necessary buckling strength is achieved, or buckling stiffeners may have to be fitted.

e) The thickness of bulwark plates shall not be less than required for side plating in a superstructure in the same position.

f) A stiffener shall be continuously welded to the upper edge of the bulwark.

g) Bulwark stays shall be able to withstand design sea pressures as for superstructure side wall. The stays should be in line with transverse beams or local transverse stiffening. The deck beam shall be continuously welded to the deck in way of the stay. Bulwarks on forecastle decks shall have stays fitted at every frame.

h) Stays of increased strength shall be fitted at ends of bulwark openings. Openings in bulwarks shall not be situated near the ends of superstructures.

i) Where bulwarks on exposed decks form wells, ample provision shall be made to freeing the decks of water.

3.1.6 **Bulkhead structures**

a) The scantlings of bulkhead structures shall comply with the requirements given in Sections 3.2, 3.3 and 3.4 below, and Chapter 4 as appropriate.

b) Number and location of transverse watertight bulkheads shall be in accordance with the requirements to Stability, Part II, Chapter 1.1.

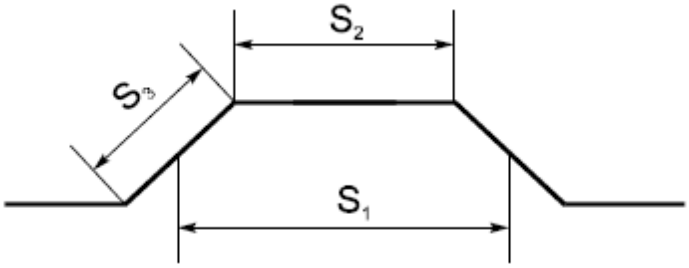
c) Bulkheads shall be able to support loads imposed by lateral loads, decks, girders, and equipment. Buckling strength is to be sufficient for this purpose.

d) Watertight bulkhead stiffeners and girders shall have end connections.

e) Longitudinal and transverse bulkheads may be corrugated.

f) For corrugated bulkheads the following definition of spacing applies (see figure below):

$s = s_1$ for section modulus calculations (corrugation as a beam).
$= 1.05\ s_2$ or $1.05\ s_3$ for plate thickness calculations.



3.1.7 **Superstructures and deckhouses**

a) The scantlings of superstructures and deckhouses shall comply with the requirements of Sections 3.2, 3.3 and 3.4 below.

b) In superstructures and deckhouses, the front bulkhead shall be in line with a transverse bulkhead in the hull below or be supported by a combination of girders and pillars. The after end bulkhead shall be effectively supported. As far as practicable, exposed sides and internal longitudinal and transverse bulkheads shall be located above girders and frames in the hull structure and shall be in line in the various tiers of accommodation. Where such structural arrangement in line is not possible, there shall be other effective support.

c) Sufficient transverse strength shall be provided by means of transverse bulkheads or girder structures.

d) At the break of superstructures which have no set-in from the ship's side, the side plating shall extend beyond the ends of the superstructure, and shall be gradually reduced in height down to the deck or bulwark. The transition shall be smooth and without local discontinuities. A substantial stiffener shall be fitted at the upper edge of plating. The plating shall be additionally stiffened as needed.

e) In long deckhouses, openings in the sides shall have well rounded corners. Horizontal stiffeners shall be fitted at the upper and lower edge of large openings for windows.

f) Openings for doors in the sides shall be substantially stiffened along the edges. The plating in the connection area between deckhouse corners and deck plating shall be increased locally.

g) Deck girders shall be fitted below long deckhouses in line with deckhouse sides.

h) Deck beams under front and aft ends of deckhouses shall not be scalloped for a distance of 0.5 m (1.6 feet) from each side of the deckhouse corners.

3.2 Plating

3.2.1 **General**

In this part the general requirements for the local strength of laterally loaded steel plates are given.

3.2.2 **Plate thickness**

Plate thicknesses shall be not less than the greater value of t_1 and t_2 calculated based on the following formulas:

$$t_1 = f_{pl}\ s\ \sqrt{P} \quad (mm)$$

f_{pl} shall be taken as:
= 1.25 in general
= 1.45 for longitudinal bulkheads, weather deck, and bottom within 0.3-0.7 L amidship

$$t_2 = t_0 + k\ L \quad (mm)$$

t_0 and k shall be taken from the table below:

Structure	t_0	k
Keel plate	7.0	0.05
Hull bottom	5.0	0.04
Inner Bottom in general	5.0	0.03
Inner Bottom w/o celling	6.0	0.03
Inner Bottom w/celling	5.0	0.03
Sea chest boundaries	6.0	0.05

Centre bottom girder	6.0	0.04
Bottom girders and floors	6.0	0.02
Hull side	5.0	0.04
Side and deck girders	5.0	0.01
Transom	5.0	0.04
Exposed deck (unsheltered)	5.5	0.02
Exposed deck (sheltered)	5.0	0.02
Longitudinal bulkheads	5.0	0.03
Collision bulkhead	5.0	0.02
Other bulkheads	5.0	0.01
Transverse frames	5.0	0.01
Stiffeners in general	5.0	0.01
Superstructure decks, front and sides, lowermost tier	5.0	0.02
Superstructure decks, front and sides, higher tiers	4.0	0.02

3.3 Frames, Girders and Stiffeners

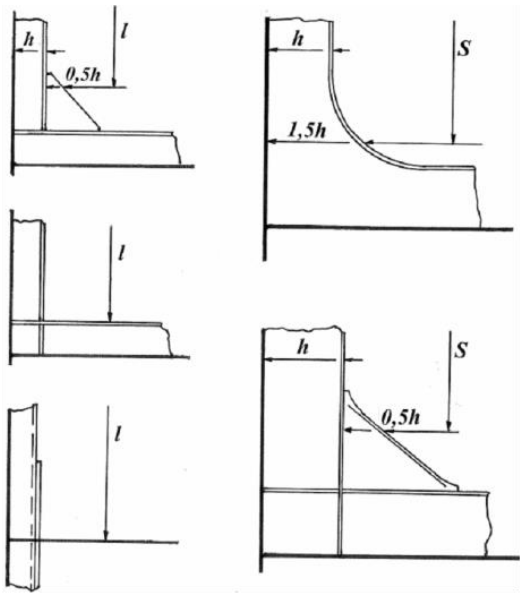
3.3.1 **General**

a) In this section the general requirements for the strength of laterally loaded frames, beams and other stiffeners in steel and constructions are given.

b) In addition to requirements in this section, webs and flanges of the stiffening members shall satisfy requirements to plating given in Section 3.2 above.

3.3.2 **Definition of span for stiffeners and girders**

The effective span of a stiffener (l) or girder (S) depends on the design of the end connections in relation to adjacent structures. Unless otherwise stated the span points at each end of the member, between which the span is measured, is to be determined as shown in below figure. When the adjacent structure does not support the bracket effectively, the span point is defined by the intersection of the line of the stiffener face plate and the end support structure. For more details, see DNV Rules for Ships, Part 3 Chapter 2 Section 3C.



3.3.3 **Section modulus**

a) The requirement of section modulus given below applies to stiffeners and simple girders. Complex girder system (grillages and ring frames) may need to be designed with direct calculation.

b) The section modulus of stiffening members is no case to be less than 15 cm^3.

c) The section modulus of stiffening members shall not to be less than:

$$Z = f_{stf}\ l^2\ s\ P \quad (cm^3)$$

f_{stf} shall be taken from the table below
s = load breadth in meters
l = stiffener span in meters
P = design pressure taken at the midspan of the member kN/m^2

The f_{stf}-values are normally to be taken as follows for the various structural members:

Item	**f_{stf}**
Continuous longitudinals	0.52
Transverse stiffeners in deck and bottom, both ends fixed	0.63
Other transverse members, both ends fixed	0.52
Other transverse members, one end fixed	0.63
Other transverse members, both ends simply supported	0.78
Vertical members, both ends fixed	0.63
Vertical members, lower end fixed	0.83
Vertical members, both ends simply supported	1.00

d) "Simply supported ends" means that the member is free to rotate at the ends, for instance in case of sniped ends.
"Fixed ends" means that rotation is prevented at the ends of the member. Bracketed or "clamped" ends are normally "fixed". Continuous stiffeners with the same load at both sides of the support may be considered "fixed".

e) The section modulus requirements in 3.3.3.b) and c) are to be regarded as the requirement about an axis parallel to the plating. As an approximation the requirement to standard section modulus for stiffeners at an oblique angle with the plating may be obtained if the formula in 3.3.3 c) is multiplied by the factor:

$$\frac{1}{\cos\alpha}$$

α = angle between the stiffener web plane and plane perpendicular to the plating.
For angles $\alpha < 15^{\circ}$ corrections are normally not necessary.

f) When several stiffeners are equal, the section modulus requirement may be taken as the average requirement for each individual member in the group. However, the requirement for the group is not to be taken less than 90% of the largest individual requirement.

g) Effective plate flange of stiffeners may normally be taken equal to the stiffener spacing.

h) The thickness of web and flange is not to be less than:

for flats:

t_{web} = 1/20 x flat depth.

for other sections:

t_{web} = 1/70 x web depth, provided net shear area > 0.075 lsP
t_{flange} = 1/12 x flange width from web.

3.3.4 **Girder webs**

a) The web thickness of the girder is given by:

$$t_{web} = k\ A\ P / h_{eff}\ (mm)$$

k = 0.06 at ends for continuous horizontal girders and upper end of vertical girders
= 0.08 at end for lower end of vertical girders
= 0.03 at midspan of the girder
= intermediate values to be obtained by linear interpolation

A = load area supported by the girder (m^2)

h_{eff} = effective girder height in m. Openings in the web are to be deducted when measuring h_{eff}

P = design pressure in kN/m^2 of the girder, measured at the middle of the load area A

b) The above requirements apply when the web plate is perpendicular to the ship's side. For oblique angles the requirement is to be increased by the factor 1/cos α, where α is the angle between the web plate of the girder and the perpendicular to the supported panel.

3.3.5 **Stiffening of girders**

Girders are to be provided with tripping brackets and web stiffeners to obtain adequate lateral and web panel stability.

3.4 Pillars

3.4.1 **General**

a) Where practicable, deck pillars are to be located in line with pillars above or below. Otherwise beams or girders in deck in way will have to be reinforced.

b) Bulkhead supporting decks may act as pillars but strength needs to be verified..

3.4.2 **Scantlings**

Solid steel pillars shall have dimensions according to the table below.

Solid steel pillars				
Load (kN)	Pillar length m			
	2.0	2.5	3.0	3.5
	Diameter mm			
30	50	53	56	59
40	53	56	60	64
60	56	60	65	69
80	59	64	69	73
100	62	68	73	78
130	65	71	77	82
160	68	75	81	86
200	71	78	84	90
240	74	81	88	94
290	77	84	91	98
340	80	88	95	102
400	83	91	99	106

Tubular pillars shall have dimensions according to the table below, based on the required scantlings of solid pillars:

Tubular steel pillars				
Diameter of equiv. solid pillar (mm)	Pillar length m			
	2.0	2.5	3.0	3.5
50	70x6.0	70x6.0	70x6.0	
55	70x6.0	70x6.0	70x6.0	
60	80x6.5	75x6.0	75x6.0	75x6.0
65	90x6.5	80x6.5	80x6.5	80x6.0
70	100x7.0	90x6.5	90x6.5	89x6.5
75	115x7.0	110x6.5	110x6.5	100x6.5
80	130x7.5	120x7.0	115x7.0	105x6.5
85	145x8.0	130x7.5	125x7.0	115x7.0
90	160x8.5	145x8.0	135x7.5	125x7.0

3.5 Aluminum

3.5.1 Aluminum alloy for marine use may be used in superstructures, deckhouses, hatch covers, hatch beams and other local items.
For use in main hull structural elements for vessels less than 24m (79ft.) in length, see PART III, 1.3, and PART VII "Appendices".

3.5.2 In weld zones of rolled or extruded products (heat affected zones) the mechanical properties given for extruded products may in general be used as basis for the scantling requirements.

3.5.3 Welding consumables giving a deposit weld metal with mechanical properties not less than those specified for the weld zones of the parent material are to be chosen.

3.5.4 Aluminum structures that are provided with insulating material between aluminum and steel in order to prevent galvanic action, shall be grounded to the hull. For this purpose, corrosion-resistant metal wires or bands shall be used.

3.6 Special Requirements

3.6.1 **Bar keel**

The scantlings of the bar keel are not to be less than:

depth: 100 + 1.5 L (mm)
thickness: 10 + 0.6 L (mm)

3.6.2 **Bar stem**

If bar stem is fitted the scantlings are not to be less than:

width:	90 + 1.2 L (mm)
thickness:	12 + 0.48 L (mm)

3.6.3 **Shaft tunnels**

a) In vessels with engine room situated amidships, a watertight shaft tunnel is to be arranged. Openings to the shaft tunnel are to be fitted with watertight covers, and are to be closed when not in use.

b) The thickness of curved top plating may be taken as 90% of the requirement to plane plating with the same stiffener spacing.

c) If ceiling is not fitted on top plating under cargo holds, the thickness is to be increased by 2 mm.

d) The shaft tunnel may be omitted in vessels with service area notations **R4** and **RE** provided the shafting is otherwise effectively protected. Bearings and stuffing boxes shall be accessible.

3.6.4 **Strengthening against slamming**

a) Vessels with minimum draught at F.P less than 0.05L, and bottom with a rise of floor less than 15 degrees, shall satisfy requirements as per DNV Rules for Ships, Pt.3 Ch.2 Sec.5 G 300.

b) The minimum draught shall be given as vessel's operational limitation.

3.6.5 **Strengthening against bow impact**

For vessels with high speed, well rounded bow lines and/or large flare, special strengthening of the bow region is to be considered, see DNV *Rules for `Ships* Pt.3 Ch.1 Sec.7 E 100.

4.0 Chapter 4 – Additional Requirements for Fishing Vessels

4.1 Cargo Holds for Fish in Bulk

4.1.1 **General - Classification**

The requirements in this Chapter are mandatory for vessels intended to carry fish in bulk. The notation **S** will be added to the class notation assigned, provided the requirements in the following are met.

4.1.2 **Assumptions**

a) The rules in this Chapter are based on the assumptions that:

- During loading in vessels having one longitudinal bulkhead, the level of cargo at any time will be approximately the same on both sides of the bulkhead

- Cargo not carried in tanks is drained before loading
- Cargo holds fully loaded with fish treated with preserving agent are checked regarding swelling.

4.2 Bulkhead Arrangement and Strength

4.2.1 **Location of bulkheads**

a) Longitudinal bulkheads are normally to be arranged as follows:

B ≤6 m (19.7 ft.): One center line bulkhead
B > 6 m (19.7 ft.): Two bulkheads
B = internal vessel breadth measured between shell or ceiling.

b) Longitudinal bulkheads are to be positioned symmetrically about the vessel's center line.

c) Transverse bulkheads in cargo holds are normally not to be spaced more than 0.15 L apart. The spacing need not be taken less than 9 m (30 ft.) and is not to exceed 12 m (39 ft.) .

4.2.2 **Design load conditions**

a) If there is one longitudinal center line bulkhead a loading condition as defined in 4.1.2 is assumed.

b) If there are two or more longitudinal bulkheads, these are to be designed for one-sided loading.

c) Transverse bulkheads are to be designed for one-sided loading.

4.2.3 **Longitudinal bulkheads with vertical wooden boards**

a) In hatch openings in which vertical wooden boards are used, a steel stiffener is to be fitted at each side of the bulkhead top, and if necessary also half way up the bulkhead.

b) The section modulus of the longitudinal stiffeners in accordance with c) is given on the assumption that stiffeners on each side of the bulkhead are connected to each other at 1/4 and 1/2 span. For area of connection, see 4.2.6 i). If the stiffeners are not connected to each other, the section modulus according to c) (below) is doubled.

c) The section modulus of each steel stiffener is to be at least:

$$Z = \frac{s+3}{6f_1} k\, h^2\, l^2 \qquad (cm^3)$$

k = 1.2 for one longitudinal bulkhead
= 1.6 for two or more longitudinal bulkheads
h = height of bulkhead in m
l = distance between supports of steel stiffeners in m
s = greatest transverse distance between bulkheads or between bulkhead and ceiling at side in m

The minimum section modulus is 40 cm^3.

d) When steel stiffeners are fitted at both the top and half height of the bulkhead, the section modulus of the steel stiffeners is decided as follows:

Upper stiffeners:

$$Z = \frac{0.4 h^2 l^2}{f_1} \quad (cm^3)$$

Middle stiffener:

$$Z = \frac{s+3}{6 f_1} k h^2 l^2 \quad (cm^3)$$

k = 1.6 for one longitudinal bulkhead
k = 2.2 for two or more longitudinal bulkheads.

Remaining symbols as given in c) above.

e) When there is one longitudinal bulkhead, the wooden board thickness is to be at least:

Without steel stiffener at mid-height:

$t = 31\ h$ (mm)

With steel stiffener at mid-height and at bulkhead top:

$t = 10\ h + 35$ (mm), min. 63 mm

h = bulkhead height in m.

When there are two or more longitudinal bulkheads, the thickness of wooden boards is to be at least:

$$t = 22 l \sqrt{h} \quad (mm), \quad \text{min } 76 \text{ mm}$$

l = greatest span between supports in m
h = bulkhead height in m.

f) In hatch openings a channel section or similar is to be fitted over the top of the bulkhead to prevent the boards from floating away from the bulkhead. If the channel section is supported by the hatchway beams, these are to be secured to the hatch coamings.

g) The depth of guides for vertical boards is to be at least 100 mm (4 in) below the deck and at the bottom. The minimum thickness of the section or plate which forms the guide is to be 10 mm (0.4 in). The clearance in the longitudinal direction of the boards is to be as small as possible.

h) Guide bars are to have a continuous weld connection to the deck and bottom structure, see 4.2.6 d). In way of hatches the bottom guides are to be stiffened with tripping brackets maximum 2 frame spaces apart. Guide bars bedded in concrete are to be fastened to the vessel's bottom structure. If this is not feasible, the guide bars are to be securely fastened in the concrete.

4.2.4 **Longitudinal bulkheads with horizontal wooden boards**

a) The distance between vertical uprights, or permanent transverse bulkheads and uprights is normally not to be greater than 2.0 m (6.56 ft.) and is in no case to exceed 2.25 m (7.38 ft.).

b) If there is one longitudinal bulkhead, the section modulus of uprights is to be at least:

$$Z = \frac{0.5(s+3)h^3 b}{f_1} \ (cm^3), \ \text{min. } 40 \ cm^3$$

h = free span of upright in m
b = distance between uprights in m
s = greatest transverse distance between bulkheads or between bulkhead and ceiling at side in meters

c) If there are two or more longitudinal bulkheads, the section modulus of uprights is to be at least:

$$Z = \frac{5.0\, h^3 b}{f_1} \ (cm^3), \ \text{min. } 40 \ cm^3$$

h = free span of upright in m
b = distance between uprights in m

d) The uprights are to be secured at top and bottom so that the reaction forces are distributed to adjacent structures.

e) If openings are cut in the uprights for the entering of the upper boards, the boards in the opening are to be locked in position to prevent their slipping out of the guide.

f) Permanent pillars for hatch end beams or transverses which also serve as guides for shifting boards or removable bulkheads in steel vessels are to have extra stiffening with brackets at the top. For scantlings of pillars, see 4.2.4 b) and c).

g) The wooden board thickness is to be at least:

$$t = k\, l \sqrt{h} \quad (mm)$$

k = 20 for one longitudinal bulkhead
k = 24 for two or more longitudinal bulkheads
h = bulkhead height in m
l = distance between uprights in m.

Minimum board thickness is 76 mm (3.0 in.) for bulkhead heights over 1.9 m (6.23 ft.) and 63 mm (2.5 in.) for lower heights.

h) Supporting guides for wooden boards in stiffeners or uprights are to be at least 75 mm (3 in) deep and made of plates or sections of at least 10 mm (.4 in) thickness. If the sections do not comply with the requirements to groove depth or breadth for bulkhead boards, a flat bar (or similar) is to be welded to the flange of the section and the breadth may be adjusted by inserting a lining into the groove.

i) Bulkheads are to extend to the deck. Between beams, filling pieces such as steel plates which are to run down the side of the uppermost board and be fastened to the board, shall be installed.

4.2.5 **Transverse bulkheads with vertical wooden boards**

a) When horizontal steel stiffeners are fitted at half height of the bulkhead, the section modulus of the steel stiffener is to be at least:

$$Z = \frac{2.6\, h^2 l^2}{f_1} \ (cm^3), \ \text{min. } 40\ cm^3$$

h = bulkhead height in m
l = distance between supports in m.

b) In exceptional cases the horizontal stiffener may be fitted on the hold side. A 100 x 12 mm (4 x .5 in) flat bar is then to be fitted on the other side of the bulkhead. The bar is bolted to the horizontal stiffener with bolts spaced not more than 200 mm (8 in). The sectional area of the bolts at bottom of threads is not to be less than:

$$A = 1.2\, h^2\, b \quad (cm^2)$$

h = bulkhead height in m
b = bolt spacing in m.

Minimum bolt diameter 16 mm (0.6 in.).

The horizontal stiffener is fastened to frames etc. with bolts of which at least 2 on each side are to be through bolts. The total sectional area of the bolts at bottom of threads at each end is not to be less than:

$$A = 0.6\, h\, l \quad (cm^2)$$

h = bulkhead height in m
l = span of stiffeners in m.

Minimum bolt diameter 16 mm (0.6 in.).

c) The wooden board thickness is to be at least:

$$t = 25 l \sqrt{h} \qquad (mm)$$

t = greatest span between supports in m
h = bulkhead height in m.

Minimum board thickness is to be 76 mm (3.0 in.) and 63 mm (2.5 in.), respectively, when the bulkhead height is more or less than 1.8 m (6 ft.).

d) For details, see 4.2.4 d), e), f), h) and i).

4.2.6 **Transverse bulkheads with horizontal wooden boards**

a) The section modulus of uprights is to be at least:

$$Z = \frac{5.3\, h^3 b}{f_1} \ (cm^3), \ \text{min. } 40\ cm^3$$

h = free span of upright in m
b = distance between uprights in m.

b) The board thickness is to be at least:

$$t = 27l\sqrt{h} \quad (mm)$$

h = bulkhead height in m
l = distance between uprights in m, maximum 2.0 m.

Minimum board thickness is to be 76 mm (3 in.) and 63 mm (2.5 in.), respectively, when the bulkhead height is more or less than 1.8 m (6 ft.).

c) For details, see 4.2.4 d), e), f), h) and i).

d) The area of attachment (bolts, etc.). at the lower end of removable uprights is to be at least:

$$A = 0.9\ h^2\ b \quad (cm^2)$$

h = bulkhead height in m
b = distance between uprights in m.

Minimum bolt diameter 16 mm (0.6 inches).

e) Sectional area at bottom of threads per bolt for bolted bulkheads is to be determined according to the formula in d) above when:

b = bolt spacing in m.

Minimum bolt diameter 16 mm (0.6 in.).

f) The area of attachment at the top for single deck vessels can be 60% of the area stipulated in d) and e) above.

g) All welds for the securing of bulkheads and uprights are to be of the double continuous type.

h) If a U-shaped collar is fitted around beams and keelson and secured with horizontal through bolts, the area of these bolts can be 60% of the area stipulated in d) and e).

i) The total area of attachment between horizontal stiffeners mentioned in 4.2.3 b), is to be at least:

$$A = 1.05\ h^2\ l \quad (cm^2)$$

h = bulkhead height in m
l = distance in m between support of stiffeners.

4.2.7 **Permanent steel bulkheads**

a) The section modulus of stiffeners on permanent longitudinal or transverse bulkheads is to be at least:

$$Z = \frac{k l^2 s h}{f_1} \ (cm^3), \text{ min. } 15 \ cm^3$$

k = 3.75 for one longitudinal bulkhead
k = 4.5 for transverse bulkheads
k = 4.5 for 2 or more longitudinal bulkheads
l = stiffener span in m
s = stiffener spacing in m
h = height in m from midpoint of stiffener span to top of bulkhead or hatch coaming.

b) The stiffener's moment of inertia is to be at least:

$$I = 2.2 \ Z \sqrt[3]{Z} \quad (cm^4)$$

Z = as given in a), with f_1=1.0.

c) Permanent pillars which are welded to permanent bulkheads and also serve as guides for removable bulkheads in way of hatches are to have scantlings as given in a) and b), when s = breadth of load surface in m. Remaining symbols as under a).

d) The plate thickness in permanent steel bulkheads is to be as given in 4.2.6 b).

e) Corrugated bulkheads will be accepted provided their strength is equivalent to that of plane bulkheads.

f) Stiffeners are to be fitted with brackets at both ends. The brackets are not to terminate on unstiffened plating or over a scallop.

g) With deep corrugations care is to be taken, in particular at the bottom, so that the corners of the corrugations do not end on unstiffened plating.

h) The various structural parts are to be connected by welding in accordance with the requirements for watertight bulkheads.

4.2.8 **Removable bulkheads of steel or aluminum**

a) Removable steel or aluminum bulkheads which are used in connection with hatches are to be double plated with the stiffeners placed horizontally. Internal surfaces of steel bulkheads are to be covered by a corrosion-resistant coating.

b) The plate thickness in removable bulkheads is to be at least:

Steel:

$$t = \frac{3.4s}{\sqrt{f_1}}\sqrt{h} + 1.5 \quad \text{(mm), min. 6 mm}$$

Aluminum:

$$t = 4.7s\sqrt{h} + 1.5 \quad \text{(mm), min. 6 mm}$$

s = stiffener spacing in m
h = height in m from upper edge of bulkhead to lower edge of plating.

The section modulus of horizontal stiffeners is not to be less than:

Steel:

$$Z = \frac{7.0 l^2 sh}{f_1} \quad (cm^3)$$

Aluminum:

$$Z = 13.5\, l^2\, s\, h \quad (cm^3)$$

l, s and h = as given in 4.2.7 a).

c) For aluminum materials with a guaranteed 0.1% tensile proof stress ($\sigma_{0.1}$) exceeding 12.5 kp/mm^2, the requirement to Z can be reduced in direct proportion. If however, the material's guaranteed $\sigma_{0.2}$ value is greater than 70% of the guaranteed ultimate tensile strength, the lower value is to be used as a basis for scantlings.

d) The moment of inertia of stiffeners is not to be less than:

$$I = k Z \sqrt[3]{Z} \qquad (cm^4)$$

k = 2.2 for steel
= 5.75 for aluminum
Z = as given in b) for steel, with $f_1 = 1.0$.

e) When welding aluminum, attention should be paid to the reduced strength of the material in the weld area, and the weld should, where practicable, be positioned in less stressed areas.

f) Guides for removable bulkheads are to have brackets at 1 m spacing. The depth of the support at the sides of removable bulkheads is to be at least equal to the bulkhead thickness, and not less than 65 mm (2.5 in). The minimum thickness of sections or plates which form the guides is 10 mm (.4 in).

g) In order to prevent galvanic corrosion, insulation is to be fitted at connections or contact surfaces between steel and aluminum.

h) If necessary, removable bulkheads are to be equipped with a securing arrangement for preventing the bulkhead from floating.

i) Slot welding is to be carried out against a 50 x 8 mm steel flat bar or equivalent.

j) Removable aluminum bulkheads are presumed constructed of a sea-water resistant alloy.

4.2.9 **Corrugated aluminum sections**

a) Corrugated aluminum shifting boards may be used instead of horizontal wooden boards. The maximum length between supports is not to be greater than:

$$l = \frac{k}{h}\left(\frac{I_A\, h\sqrt{h}}{b}\right)^{\frac{1}{3}} \quad (m)$$

k = 0.6 for one longitudinal bulkhead
k = 0.5 for 2 or more longitudinal bulkheads
k = 0.4 for transverse bulkheads
h = bulkhead height in m
b = board breadth in m
I_A = moment of inertia of board in cm^4.

b) In order to prevent galvanic corrosion, insulation is to be fitted at connections or contact surfaces between steel and aluminum.

c) The corrugated boards are to be made of seawater resistant aluminum.

d) For details the same rules apply as for bulkheads with horizontal wooden boards.

4.2.10 **Pillars**

a) Pillars acting as supports for deck loads are to be permanently connected at top or bottom. If the connections are arranged with bolts these bolts are to be secured by welding.

b) Pillars acting as supports for shifting boards only may have ordinary bolt connections.

4.2.11 **Bulwarks**

a) The thickness of bulwark plating is not to be less than 80% of Rule thickness of side shell plating, and minimum 6 mm.

b) Bulwark stays are to be fitted at every 2nd frame.

4.3 Fishing Vessel Additional Notations

4.3.1 Stern Trawler - Additional requirements

a) Vessels built for stern trawling may be given the additional class notation **Stern Trawler** provided the additional requirements in b) through i) below are also complied with.

b) The thickness of bottom and side shell plating up to a height 2 m (6.5 ft.) above loaded waterline is not to be less than:

$$t = \frac{4 + 0.04L}{\sqrt{f_1}} + 2 \quad (mm)$$

t need not be taken greater than 10 mm.

c) The thickness of side shell plating above the limit given in b) is not to be less than given in DNV Rules for Ships Pt.3 Ch.2 Sec.7.

d) For frame spacings exceeding the rule standard value s_s given in Part I, Chapter 10, Section 10.3 (Table), the plate thickness is to be increased in direct proportion.

e) The thickness of bottom plating is also to comply with the requirements to buckling strength as given in DNV's Rules for Ships Pt.3 Ch.1 Sec.14 or Pt.3 Ch.2 Sec.13.

f) The thickness of trawl ramp and adjacent side plating, stern and side plating abaft the point where the trawling doors are normally taken on board, is not to be less than:

$$t = \frac{5 + 0.12L}{\sqrt{f_1}} + 2 \quad (mm), \text{ min. } 12 \text{ mm}$$

g) Between gallows the bulwark plating is to have the same thickness as the side shell plating, and bulwark stays are to be fitted at every frame.

h) Where bulwarks, sheer strake, side shell and transom plating are particularly exposed to blows and chafing, steel rubbing pieces are to be fitted, consisting of minimum 75x37 mm half-round bars or equivalent.

i) The section modulus of stiffeners in the trawl ramp is not to be less than:

$$Z = \frac{15 l^2 s}{f_1} \quad (cm^3)$$

4.3.2 **Fish RSW Tanks**

a) Fishing Vessels meeting b) through f) below may be given the additional notations **RSW**.

b) See also Part V, Chapter 4, Section 4.7.2 for pumping system for filling and emptying of seawater.

c) Refrigerated Sea Water (RSW) tanks for transportation of fish are to be designed for relevant pressure heads in accordance with the rules. See PART IV, 2.2.5 b).

d) Where an internal skin is fitted and welded continuously to every other frame/stiffener and slot-welded to the rest, and the gap between skin and hull structure is filled with insulation of an approved type, an effective flange, b = 40 t (where t = skin thickness, minimum 5 mm) may be included, when calculating the section modulus of strength members. The skin plate is to be made continuous with good end connections and should not be terminated abruptly.

e) The insulation material is to have good adhesion to steel and suitable strength characteristics (e.g. polyurethane foam, density of 45 kg/m^3). The steel surface is to be corrosion protected before it is insulated.

f) Corrugated bulkheads are to be supported along both bulkhead flanges in the bottom structure with sufficient connections to crossing members. Carlings are to be fitted in way of corners in corrugations and ends of unstiffened plate panels.

PART V - MACHINERY AND SYSTEMS

1.0 Chapter 1 – Rotating Machinery – General and Drivers

1.1 Documentation

1.1.1 **Documentation Required – Piping Drawings**

a) Bilge, Sea chests, and Ballast
b) Fuel and lube oil
c) Exhaust piping
d) Cooling water
e) Raw and potable water
f) Sanitary water black/grey
g) Overboard discharges
h) Hydraulic systems
i) Compressed/Control Air
j) Oily water separator
k) Fire main
l) Refrigeration
m) Ventilation

1.1.2 **Documentation Required – Electrical**

a) One line diagram AC and DC
b) Load Analysis – AC and DC
c) Distribution AC and DC
d) Lighting main and emergency
e) Interior communication
f) General Alarm and fire detection
g) Switchboards (main and emergency)
h) Alarm and monitoring
i) Propulsion Control
j) Steering control
k) Motor control
l) Emergency shutdowns

1.1.3 **Documentation Required – Specifications and Materials**

a) All relevant manufacturers data

- Specifications
- Certifications
- USCG approvals
- Type Approvals
- Other industry accepted standard documentation may be considered

1.1.4 **Other Documentation Required**

See Part I Chapter 3, 3.5 “Plan Approval” for documentation showing compliance with rule requirements.

1.2 Certification

1.2.1 **Machinery**

a) Class usually employs a process of on-site certification of machinery and components (the CMC process) or type approval for key machinery and components used in the shipbuilding process.

b) For fishing vessels classed under these rules, machinery and components shall meet industry accepted standards with supporting documentation per 1.1.3 above.
See also PART I Chapter 9.

c) New technologies or machinery and components heretofore unused in the industry shall be certified and approved by DNV.

<<<<Guidance Note>>>>

All new marine diesel engines above 130 kW are required to have an Engine International Air Pollution Prevention (EIAPP) certificate, issued by the EPA. For further guidance, see http://www.epa.gov/oms/marine.htm .

<<<<End Guidance Note>>>>

1.3 Propulsion and Auxiliary Engines

1.3.1 **Engines**

a) Engines shall be recognized by the fishing vessel industry as industry accepted standard for marine use. Engines with a power exceeding 2500 kW or engines of unconventional design shall be certified by DNV or another recognized organization. Individual DNV approval or product certificates are normally not required. Engine documentation shall meet the requirements in 1.1.3 above.

b) Inboard diesel engine(s) shall normally be used for main propulsion. Natural gas fueled engines can be considered as an alternative (DNV Rules for Classification of Ships Part 6 Chapter 13).

1.3.2 **Engine room**

a) The engine room shall not be used for other purposes. The normal service points of the engine shall be readily accessible. Rotating parts shall be shielded to prevent personal injury.

b) Windows, scuttles or similar in engine room shall have the same fire rating as surrounding structure.

c) The engine room shall be equipped with artificial lighting.

d) Ventilation of the engine room for the engine's air consumption and cooling shall be arranged according to the engine manufacture's specifications. The engine room/space shall have ventilation to the outside. The total cross sectional area of intake ventilation openings and ducts shall not be smaller than 7 cm^2/kW or the engine manufacturer's specifications.

e) Ventilation openings shall be equipped with fire closing appliances that can be operated from outside the engine room and secured in open and closed position.

f) All surfaces above 220ºC (428ºF) shall be shielded/insulated.

g) See also requirements for guard for exposed hazards in 46 CFR 28.215

1.3.3 **Engine controls**

a) Engines shall be possible to monitor from the helm position. The following indicators or alarms shall be visible/audible:

- speed of revolutions (may be omitted for auxiliary engines)
- lubrication oil pressure
- cooling water temperature
- alarm for loss of exhaust cooling

The instrumentation shall be equipped with adjustable lighting.

1.3.4 **Exhaust**

a) Each engine shall have a separate exhaust system or a system installed in accordance with the engine manufacturer's recommendations.

b) Exhaust lines shall be accessible for inspection.

c) Exhaust line with a surface temperature exceeding 80ºC (176°F) shall be equipped with protection against touching. Exhaust piping shall not be arranged in such a way that other materials or structures reach temperatures above 65ºC (149°F).

d) Materials in seawater cooled exhaust systems shall be corrosion resistant. Special attention shall be given to avoid galvanic corrosion.

e) Seawater cooled exhaust systems shall be equipped with alarm at the steering position for loss of seawater cooling or for high temperature in the exhaust pipe.

f) Exhaust outlets shall be at least 100 mm (4 in.) above loaded water line or the exhaust line shall consist of a metallic pipe brought at least 100 mm (4 in) above loaded water line.

g) At one location the lower inside surface of the exhaust pipe shall be at least 350 mm (13.7 in.) above loaded water line. From this location the pipe shall fall continuously to the exhaust outlet.

h) Flexible rubber and plastic hoses for wet-exhaust system shall be a class B hose according to ISO 13363:2004 or equivalent.

2.0 Chapter 2 - Rotating Machinery - Driven units

2.1 Shafting

2.1.1 The diameter of steel shafting shall be in accordance with the engine manufacturer's recommendation, but not smaller than:

$$d = 90 \cdot \left(\frac{P}{RPM}\right)^{\frac{1}{3}} \cdot \left(\frac{600}{Rm + 160}\right)^{\frac{1}{3}} \ (mm)$$

P = maximum continuous power of driving engine (kW)
RPM = shaft revolutions pr. minute
Rm = tensile strength (MPa).

Shafting shall be supplied by recognized manufacturers. See also Part I, Chapter 9, 9.1.1 for possible additional certification. The dimensions of shafting fabricated from materials other than steel are subject to special consideration.

2.2 Shaft brackets and Stern Tubes

2.2.1 Shaft bearings shall be sufficiently lubricated.

One-armed shaft brackets shall have a section modulus W at the vessel's bottom not smaller than:

$$W = \frac{l \cdot d^2}{112 \cdot Rm} \quad (cm^3)$$

d = shaft diameter (mm)
l = length of bearing (mm)
Rm = tensile strength (MPa)

.

At the bearing the section modulus shall not be smaller than 0.6 W.

2.3 Gears and Propellers

Gears and propellers shall be supplied by industry recognized manufacturers. See also Part I, Chapter 9, 9.1.1 for possible additional certification.

3.0 Chapter 3 – Steering

3.1 Definitions

The following definitions apply in this Chapter:

K = steering force on tiller at point of actuation (N)
F = steering force on rudder (N)
A = rudder area (m^2)
V = maximum vessel speed (knots), not to be taken less than 10 knots

S_a = length of tiller from rudder stock center to point of actuation (mm) (inches)
S_b = distance from pressure center of rudder to lower rudder bearing for spade rudders, to upper bearing for balance rudder (mm)
S_v = distance from rudder pressure center to axis of rotation, not to be taken smaller than 40% of the chord length aft of the leading edge for plate rudders, not to be taken smaller than 30% of the chord length aft of the leading edge for profile rudders (mm)
P = maximum engine power output (kW)
M = combined bending moment and torque on rudder stock (Nmm)
d = diameter of rudder stock (for solid stock) (mm)
$\sigma_{0.2}$ = yield stress of rudder stock or other item, as applicable (MPa).

3.2 Arrangements

3.2.1 General

a) The steering arrangement shall ensure reliable maneuvering of the vessel at the maximum engine power for which the vessel is certified.

b) It shall be possible to steer the vessel by means of an emergency arrangement when the normal means of actuating the rudder has failed.

c) Rudder stops shall be fitted.

3.3 Forces on Steering System

The steering force K at end of tiller with rudder shall not be taken smaller than:

$$K = F \cdot \frac{S_v}{S_a} \quad (\mathrm{N})$$

with F not taken smaller than:

$$F = 110 \cdot A \cdot V^2 \quad (N)$$

The means of actuating the rudder shall have a capacity corresponding to not less than 2 times the maximum torque on the rudder stock.

3.4 Rudder Stock

The combined bending moment and torque, M, on the rudder stock shall not be less than:

for balance rudders

$$M = \left(\frac{F \cdot S_b}{4} + \frac{F}{2} \cdot \left(S_b + 2 \cdot S_v^2 \right)^{1/2} \right) \quad (Nmm)$$

for spade rudders

$$M = \left(\frac{F \cdot S_b}{2} + \frac{F}{2} \cdot \left(S_b + 2 \cdot S_v^2 \right)^{1/2} \right) \quad (Nmm)$$

The diameter d of the rudder stock shall not be smaller than:

$$d = \left(\frac{M}{\sigma_{0.2}} \right)^{\frac{1}{3}} \ (mm)$$

for solid stocks.

Hollow stocks shall satisfy the following criteria:

$$d = \left(d_0^4 - d_i^4 \right)^{1/3} \ (mm)$$

d_o = outer diameter of stock
d_i = inner diameter of stock.

The length of the bearings shall normally not be smaller than d. The nominal contact pressure on the bearing (stock diameter x length of bearing) shall normally not exceed:

- 7.0 (MPa) for steel against steel
- 4.5 (MPa) for steel against white metal
- 5.5 (MPa) for steel against synthetic materials, water lubricated

.

The diameter of pintles shall not be smaller than

$$0.6 \cdot d + 5 \text{ mm}$$

Fillets shall be carried out with radii such that undue stress concentrations are avoided.

The diameter of bolts, d_b, in flanged couplings shall not be smaller than:

$$d_b = 0.65 \cdot \frac{PCD}{2 \cdot \sqrt{n}} \quad (mm)$$

n = number of bolts, shall not be less than 4
PCD = pitch circle diameter, shall not be smaller than $2 \cdot d$

The thickness of the flanges and the width outside the bolt holes shall not be smaller than d_b.

The packing box of the rudder stock housing shall normally be placed at least 100 mm (4 in.) above the deepest loadline. If placed below, a grease filled packing box with at least two seals shall be fitted.

3.5 Rudder

Rudders can be fabricated from steel, or aluminum.

The plate thickness t in plate rudders shall not be smaller than:

$$t = 3 + 0.125\ d\ (mm)$$

The plate thickness of profile rudders shall not be smaller than:

$$t = 4\ (mm)$$

The section modulus W of the rudder at any horizontal section through the rudder shall not be smaller than given by:

$$W = \frac{M_{bend}}{\sigma_{all}}$$

M_{bend} = bending moment at the cross section due to maximum rudder lift force
σ_{all} = allowable bending stress
σ_{all} shall not be taken greater than:

- 50% of specified minimum yield strength for steel.
- 50% of minimum yield strength in welded condition for aluminum

The total effective shear area A_{web} of vertical webs in any horizontal cross section shall not be smaller than given by:

$$A_{web} = \frac{S}{\tau_{all}}$$

S = maximum lift force of the part of the rudder below the cross section
τ_{all} = allowable shear stress
τ_{all} shall not be taken greater than:

- 29% of specified minimum yield strength for steel.
- 29% of minimum yield strength in welded condition for aluminum

3.6 *Reserved*

4.0 Chapter 4 - Piping Systems and Tanks

4.1 General

4.1.1 The material(s) used in piping systems shall be suitable for the carried liquid and external environment to which it is exposed. Corrosion and variation in temperature shall be considered. Different materials shall not be combined such that there is a possibility for galvanic corrosion.

4.1.2 All components in the installation shall have sufficient strength and be so mounted that the system including its foundations will withstand the accelerations and vibrations to which it may be exposed as well as the design pressure. They shall be protected against mechanical damage. Expansion loops or equivalent arrangement shall be provided to allow expansion/contraction of pipes.

4.1.3 Flexible hoses used in fuel system, seawater cooling system, bilge system and other systems where a failure of the connection will lead to flooding shall be fitted with two stainless steel hose clamps or pressed on end couplings.

4.1.4 Pipes or hoses shall not be installed over switchboards or electrical distribution panels.

4.2 Bilge System

4.2.1 **General**

a) The bilge system shall normally consist of rigid pipes fabricated from steel, and shall be permanently installed. If flexible hoses are used in specific locations, attention shall be given to prevent collapse due to suction.

b) The bilge system shall be able to empty all compartments, except tanks.

c) At least two bilge pumping units shall be provided. One of these may be driven by the main engine.

d) Each pumping unit may consist of one or more pumps connected to the main bilge line, provided their combined capacity is sufficiently large.

e) The bilge pumping units may be connected to other systems for service duties of an intermittent nature provided the system function may be fully restored to bilge pumping in less than 10 minutes.

4.2.2 **Capacity and types of bilge pumping units**

a) Each bilge-pumping unit shall be capable of giving a water velocity of at least 2 m/s through a rule size main bilge pipe.

b) Pumping unit capacity determined from pipe diameter given in 4.2.4 is specified in the following Table

Pipe diameter and corresponding bilge pump capacity	
Bore of bilge pipe	***Capacity of each pump***
50 (mm)	15 m^3/h (250 liters/min)
55 (mm)	18 m^3/h (300 liters/min)
60 (mm)	21 m^3/h (350 liters/min)
65 (mm)	25 m^3/h (420 liters/min)

4.2.3 **Bilge pumping arrangement**

a) All bilge pump connections to the main bilge line shall be fitted with stop valves.

b) The bilge pumps shall be so arranged that either can be used while the other is being overhauled.

4.2.4 **Size of bilge suctions**

a) The internal diameter of the main bilge line shall not be less than given by the following formula:

d = 1.68 L(B + D) + 25 (mm)

L = length of vessel (m)
B = breadth of vessel (m)
D = depth of vessel to bulkhead deck (m).

b) The internal diameter of any branch suction shall not be less than 50 mm (2.0in.).

4.2.5 **Bilge wells**

The bilge wells are normally to have a capacity of at least 0.15 m^3.

4.2.6 **Bilge and drainage arrangement - cargo holds for fish in bulk**

a) Good drainage for water, oil or brine from the cargo is to be arranged. Trunks and gutters are to be located such that they at all times will provide good drainage from all layers of the cargo, throughout the hold.

b) In each bin there is to be drainage to bilge well through vertical drainage trunks of perforated plates, grating, etc. as specified in the table below.

The minimum acceptable perforated circumference of each trunk is 0.3 m (1.0 ft.). The perforations are to consist of 4-8 mm (0.16 – 0.31 in.) holes or equivalent.

Drainage Arrangement in Holds for Fish in Bulk		
Area in m^2 of bin below deck	***Minimum number of drainage trunks per bin***	***Total length in m of trunk perforated circumference per bin***
A < 10	2	0.8
10 ≤ A < 15	3	1.0
15 ≤ A < 20	3	1.2
20 ≤ A < 25	4	1.4
25 ≤ A < 30	4	1.6
30 ≤ A < 35	5	1.8

c) Each cargo hold is to have a bilge well situated to drain the compartment effectively. If the length of the watertight compartment exceeds 9 m, there is to be a bilge well also at the forward end.

d) Each bilge well is to have a volume not less than 0.15 m^3.

e) From each bilge well, a separate branch suction line is to be led to the engine room. The bilge manifold valves are to be of screw-down non-return type. All valves are to be fitted in readily accessible positions.

f) The manifold collecting branch suction lines from cargo holds for fish in bulk are to have no connections from dry compartments. The manifold is to be directly connected to the largest bilge pump. In addition, a connection is to be provided to another bilge pump.

g) The internal diameter of the branch suction lines is to be minimum 50 mm (2.0 in.).

h) Means for back-flushing bilge suctions is to be provided. The connecting of water supply for back-flushing is to be by portable means, e.g. hose.

4.2.7 **Bilge and drainage arrangement – tanks for fish in refrigerated sea water tanks (RSW-tanks)**

a) The RSW-tanks are to have a pumping system for filling and emptying of seawater. The system is to have pipe dimensions complying with the requirements for ballast systems.

b) If the tanks are to be used also for carrying dry cargo, the tanks are to be arranged with bilge system. If the tanks are to be used for carrying fish in bulk, the requirements given in 4.2.6 are also to be complied with.

c) Where RSW-tanks are also arranged for carrying dry cargo, blank flanging or two closeable valves in series to avoid ingress of water from RSW system to the bilge system are required.

4.2.8 **Engine room bilge water monitoring**

Alarm for high level in bilge wells is to be installed at the operating station.

4.3 Fuel system

4.3.1 **Arrangement**

a) Fuel strainers, filters and water separators shall be easily accessible and possible to replace, drain and clean with engine in operation.

b) Fuel tanks shall not be located above the engine.

c) Fuel tanks may be integral or separate. Separate tanks shall be mounted such that air can circulate freely around the tank and such that they can be readily inspected or movable for inspection.

4.3.2 **Fuel tanks**

a) Fuel tanks shall be fabricated from steel, or aluminum.

b) The design pressure p of fuel tanks shall be taken as the larger of:

$$p = 25 \cdot h_S \ (kN/m^2), \text{ and}$$
$$p = 6.6 \cdot h_P \ (kN/m^2)$$

h_S = height of tank (m)
h_P = height from bottom of tank to top of filling and air pipe (m)

.

c) The plate thickness (mm) shall not be smaller than:

Carbon steel:	2.0 (mm) (0.078 in.)
Stainless steel:	2.0 (mm) (0.078 in.)
Aluminum:	2.0 (mm) (0.078 in.)

d) Fuel tanks shall have an inspection hatch. For removable tanks an inspection hatch is not required.

e) Wash bulkheads shall allow adequate circulation of the fuel along the top and bottom of the tank.

f) Each tank shall have separate filling pipe and air vent. The air vent shall be mounted in a way to prevent water from entering the tank. The filling pipe shall have an internal diameter of at least 38 mm (1.5 in.). The vent pipe shall have an internal diameter of at least 16 mm (0.6 in.). If the filling pipe has a screw coupling or similar device, the internal cross sectional area of the vent pipe shall not be smaller than 125% of the internal cross sectional area of the filling pipe.

g) The amount of fuel in the tank arrangement shall be possible to verify at any given time, e.g. by fitting a level gauge to each tank. External sight glass shall have self-closing valves.

4.3.3 **Fuel piping**

a) Fuel lines may consist of metal pipes or flexible hoses, or a combination thereof. Fuel lines shall not pass over engine(s) or be arranged such that a leakage can occur on to sources of ignition (e.g. hot surfaces).

b) The engine shall be connected to the fuel line by a short flexible hose.

c) Flexible hoses shall satisfy the requirements of ISO 7840 or equivalent, and are to be marked in accordance with these requirements

d) Shutoff valves, installed so as to close against the fuel flow, must be fitted in the fuel supply lines, one at the tank connection and one at the engine end of the fuel line to stop fuel flow when servicing accessories. The shutoff valve at the tank must be manually operable from outside the compartment in which the valve is located, preferably from an accessible position on the weather deck. If the handle to the shutoff valve at the tank is located inside the machinery space, it must be located so that the operator does not have to reach more than 300 millimeters (12 inches) into the machinery space and the valve handle must be shielded from flames by the same material the hull is constructed of, or some noncombustible material. Electric solenoid valves must not be used, unless used in addition to the manual valve. At least two hose clamps fabricated from stainless steel shall be used at each connection on flexible hoses. Spigots shall be sufficiently long to accept the hose clamps and have grooves or a bead.

e) Flexible hoses for pressurized system(s) shall be fitted with pressed on end fittings.

4.3.4 **Testing**

After installation a leakage test shall be carried out of the whole installation with a pressure equal to 20 kPa (3.0 psi).

4.4 Seawater cooling systems

4.4.1 **General**

a) Flexible hoses may be fitted. Flexible hoses shall be mounted in such a way that they are protected against mechanical damage. Flexible hoses shall comply with the same requirements given for flexible hoses used in fuel systems. Flexible hoses shall be secured with at least two stainless steel hose clamps or pressed-on couplings.

b) Seawater intakes shall have strainers or filters. All filters shall be fitted such that they can be cleaned while the engine is running.

4.5 Freshwater systems and grey water systems

4.5.1 **General**

a) Fresh water tanks shall be accessible for cleaning.

b) Integral freshwater tanks shall not be located contiguous to fuel or grey water tanks.

c) Marine Sanitation Devices shall be installed in accordance with USCG and WPCA requirements.

4.6 Shell penetrations

4.6.1 **General**

a) Penetrations located lower than 200 mm (8 in.) above deepest waterline shall be arranged with closing valve or other equivalent means for preventing water from passing inboard. The valve shall be readily accessible for operation from a position above the deck.,

b) Penetrations located less than 200 mm (8 in.) above deepest waterline and connected to a system with open inboard end located below lowest part of bulkhead-deck, and penetrations located in a position immersed at an angle of heel of 10^{o}, shall in addition to closing valves be arranged with non-return valves.

c) Valves shall have system names and indicators showing closed and open position.

d) Material of valves and hull flanges shall be of steel, bronze or other equivalent accepted ductile material resistant to corrosion.

5.0 Chapter 5 - Electrical Systems

5.1 Scope

5.1.1 General

This Chapter does not apply to electrical components on the propulsion or auxiliary engine(s). Equipment considered to represent a safety hazard may be required to be replaced or modified regardless of where it is mounted.

5.2 DC systems – Voltage ≤ 150 V

5.2.1 General

a) Direct current systems which operate at nominal potential not exceeding 150 V shall comply with ISO 10133 or equivalent, and the requirements given in this section.

b) Electrical schematic drawings showing the rating of all protective devices and size of all electrical cables shall be submitted for approval and shall be supplied with the vessel when delivered and be available onboard. All markings shall be permanent.

c) Electrical components shall have enclosure Ingress Protection (IP) rating(s) suitable for the exposure where they are located. Electrical equipment located in an environment with explosion hazard shall be Ex approved or equivalent. Battery installations are considered explosion hazard areas.

5.2.2 Battery installations

a) Battery installations with a capacity exceeding 5 kWh (based on the 10-hour discharge rate) shall be placed in compartments with ventilation to the outside of the vessel. Battery installations placed in accommodation areas shall be ventilated separately to the outside of the vessel.

b) Each battery shall be marked indicating the connected consumers and how connections between batteries shall be carried out.

c) Batteries installed inside the same watertight compartment as the propulsion engine(s) shall be mounted such that they are not short circuited when the compartment is filled with water up to the load-water line. Alternatively, emergency batteries for supply to emergency lighting, navigation equipment and radio, may be placed above main deck. See 46 CFR 28.375.

d) For main engines with electric starter, the starter shall be possible to connect to two separate (groups of) batteries. One of the groups (batteries) shall be assigned to starting and shall not be used to supply other consumers. The other group (battery) may be one used for consumers and which has a capacity that is sufficient to start the main engine.

5.2.3 **Distribution systems**

a) For propulsion engines with a power output less than 100 kW (134 hp) the engine may be used as conductor when starting the engine.

b) Gas alarms, theft alarms, heating equipment and automatic bilge pumps may be connected between the battery/generator and the main switchboard, but must have separate protection with circuit breakers.

c) Cable penetrations in watertight bulkheads and decks shall be watertight.

d) The following cables shall be carried as separate, insulated single conductors:
- conductor to connect generator to batteries
- conductor to connect battery to electrical starter
- conductor to connect battery (or generator) to switchboard

The conductor between battery and electrical starter shall not be protected by circuit breaker.

The conductor shall comply with the engine manufacturer's recommendations.

e) Interior lighting shall be distributed on at least two separate circuits.

5.2.4 **Protection**

a) Circuit breakers shall not be placed in tank compartment or compartments for equipment that may generate explosive gases (e.g. battery installation).

b) Safety equipment as e.g. radio, horn, search light etc. and consumers drawing a current larger than 5 A shall be equipped with separate circuit breakers.

c) Navigation lights shall have separate circuit breakers. If the functioning of the navigation light cannot be monitored from the steering position each light shall be equipped with an optical or audible alarm to the steering position indicating if the light is functioning. Malfunctioning of the monitoring system shall not influence the function of the navigation light.

5.2.5 **Switchgear and control gear assemblies**

a) Switchboards shall be protected against leaks and spray from sea and piping and shall be accessible for maintenance, replacement and visual inspection during operation.

b) Each group on the switchboard shall be independently available for measurement of insulation.

5.3 AC systems – Voltage ≤ 250 V

5.3.1 General

a) Alternating current systems which operate at nominal voltage not exceeding 250 V shall comply with ISO 13297 or equivalent and the requirements given in this section. For systems operating with higher voltages DNV's Rules for Ships will apply.

b) Electrical schematic drawings showing the rating of all protective devices and size of all electrical cables shall be submitted for approval and shall be supplied with the vessel when delivered and be available onboard. All markings shall be permanent.

Electrical components located in an environment with explosion hazard shall be Ex approved or equivalent. Battery installations and gas installations are considered explosion hazard areas.

5.3.2 Distribution systems

a) Cable penetrations in watertight bulkheads and decks shall be watertight.

b) Interior lighting shall be distributed by at least two separate circuits, one of which must be an emergency circuit to illuminate light fixtures in the event of loss of main power. Alternately, light fixtures with internal battery backup may be utilized. If this type of light fixture is used, the internal batteries shall be inspected for functionality on the same schedule as other main battery systems.

5.3.3 Protection

a) Circuit breakers shall not be placed in tank compartment or compartments for equipment that may generate explosive gases (e.g. battery installation).

b) Safety equipment as e.g. radio, horn, search light etc. and consumers drawing a current larger than 5 A shall be equipped with separate circuit breakers.

c) Navigation lights shall have separate circuit breakers. Each light shall be equipped with an optical or audible alarm to the steering position indicating if the light is functioning. Malfunctioning of the system for indication shall not influence the function of the navigation light.

5.3.4 Switchgear and control gear assemblies

a) Switchboards shall be protected against leaks and spray from sea and piping and shall be accessible for maintenance and replacement and visual inspection during operation.

b) Each group on the switchboard shall be independently available for measurement of insulation.

c) All switchboards and assemblies shall be of the "dead front" type to prevent accidental contact with energized components during normal operation.

d) Instruments, handles, push buttons or other devices that should be accessible for normal operation shall be located on the front of switchboards and control gear.

e) All other parts that might require operation shall be accessible. Doors behind which equipment requiring operation is placed shall be hinged. Hinged doors, which shall be opened for operation of equipment, shall be provided with easily operated handles or similar. Arrangement for keeping the doors in open position shall be provided.
Hinged doors/panel covers shall be provided with a ground conductor to the main equipment.

f) Main and emergency switchboards shall have handrails with an insulating surface.

g) The cable(s) for shore connection shall have a solid sheath resistant to oil and weathering. The socket inlet shall be protected from spray water and rain.

h) Equipment connected to the shore connection shall be grounded to the shore connection.

5.4 Emergency power supply

5.4.1 An alternate power supply shall be available, capable of supplying the following consumers for a period of at least 6 hours (at least 3 hours for vessels with **RE** notation):

- emergency lights in wheelhouse, accommodation, engine room, launching stations, alleyways, stairways and exits, machinery spaces and control stations (for small vessels portable flashlights may be accepted as emergency lights)
- navigation lights or Not Under Command lights
- fire detection and alarm systems
- remote control devices for fire extinguishing systems, if electrical
- navigation equipment
- communications equipment

5.4.2 The alternate power supply and associated switchboard shall be fitted outside the engine room and above the flooded waterline with the engine room flooded.

6.0 Chapter 6 – Refrigeration Systems

6.1 Sizing Requirements and Reference to Rules

6.1.1 Fixed refrigeration plants (including air conditioning plants) with a total prime mover rated effect of 134 hp (100 kw) and above shall comply with DNV's Rules for Classification of Ships Part 5 Chapter 10.

6.1.2 Refrigeration plants using Group 2 refrigerants (i.e. ammonia) shall comply with the safety requirements as given in Part 5 Chapter 10 above irrespective of size.

6.1.3 Spaces containing refrigeration installations and not fitted with mechanical ventilation shall be provided with an oxygen deficiency monitoring system. An alarm indication shall be located at the entrance to the space

7.0 Chapter 7 – Navigation, Communication and Other Systems

7.1 Navigation

7.1.1 General

a) Navigation lights according to U.S. Coast Guard regulations shall be fitted.

b) Vessels must have the navigational information on board required by 46 CFR Part 28.

7.1.2 Compass

Each vessel must be equipped with an operable magnetic steering compass, with a compass deviation table at the operating station. Ref. 46 CFR Part 28.

7.1.3 Electronic position fixing-devices:

Ref.: 46 CFR Part 28.

7.1.4 Communications Equipment & Operator Requirements

Ref: 46 CFR Part 28, 47 CFR Part 80.

7.2 Pollution Prevention

Many pollution prevention requirements are applicable to all fishing vessels. See for instance 33 CFR Parts 151, 155, and 159, 40 CFR 140.3 and 140.4, and MARPOL Annex VI.

7.3 Anchors and Mooring Equipment

7.3.1 General

Fishing vessels are to be equipped with anchoring equipment, anchor chains or wire ropes, stoppers and a windlass or other arrangements for dropping and hoisting the anchor, and for holding the vessel at anchor in all foreseeable service conditions. Fishing vessels shall also be provided with adequate mooring equipment for safe mooring in all operation conditions.

7.3.2 Design information

a) Please refer DNV's Rules for Classification of Ships, Part 3, Chapter 3, Section 3, "Anchoring and Mooring Equipment", in particular Table C2. C205 may be applied for vessels with restricted service (**R** notations).

b) See also Annex II of the "IMO Code for Safety for Fishermen and Fishing Vessels, Part B" .

7.4 Other systems

7.4.1 Cooking and Heating Appliances

a) Stoves and heating units shall be securely fastened.

b) Where flues are installed, they shall be insulated or shielded to avoid overheating or damage to adjacent material or to the structure of the vessel.

7.4.2 **Units using liquid fuel**

a) Open-flame burners shall be fitted with a drip-pan.

b) Drip-pans shall have at least 20 mm high coaming able to collect the fuel in case of leakages.

c) Where open-flame-type water heaters are installed, adequate ventilation and flue protection shall be provided.

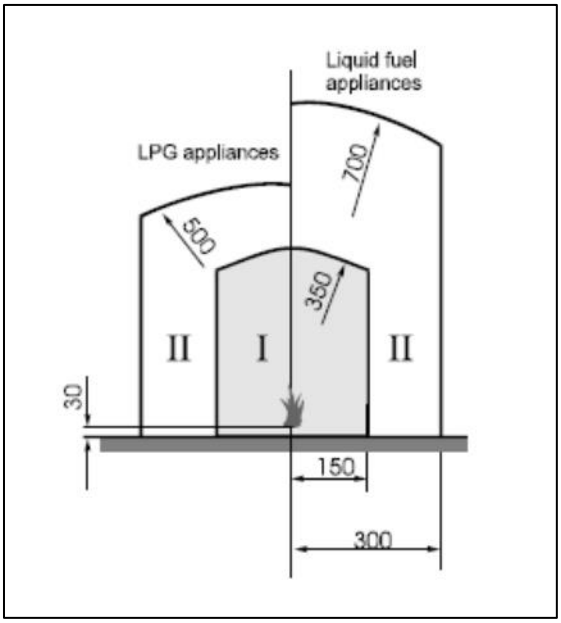
d) Where a pilot light is installed, the combustion chamber shall be room sealed, except for stoves.

e) Appliances using gasoline for priming, or as a fuel, shall not be installed.

7.4.3 **Liquid fuel tanks for stoves and heating appliances**

a) For tanks and supply lines, the applicable requirements of *"Rules for Classification of Ships Ch.5 Sec.4"* apply.

b) Non-integral tanks shall be securely fastened and shall be installed outside Zone II, see figure below (units in mm):



c) A readily accessible shut-off valve shall be installed on the tank. If this is outside the galley, a second valve shall be fitted in the fuel line in the galley space, outside zone II, see figure in b) above, and not behind the stove. This requirement does not apply where the tank is located lower than the stove/heater and there is no possibility of back siphoning.

d) Fuel lines shall be equipped with a high temperature shut off device.

e) Filler openings for tanks shall be visibly identified to indicate the type of fuel to be used with the system.

7.4.4 **Materials near open flame appliances**

a) Materials and finishes used in the vicinity of open-flame cooking and heating devices within the ranges defined in Figure above, shall comply with the following requirements, taking into account the movement of the burner up to an angle of 20° where gimbaled stoves are fitted. The requirements do not apply to the stove itself:

- Free-hanging curtains or other fabrics shall not be fitted in Zone I or II.
- Exposed materials installed in Zone I shall be glass, ceramics, aluminum, ferrous metals, or other materials with similar fireproof characteristics, or be thermally insulated.
- Exposed materials installed in Zone II shall be glass, ceramics, metals, or other materials with similar fireproof characteristics, or be thermally insulated from the supporting substrate to prevent combustion of the substrate, if the surface temperature exceeds 80ºC.

7.4.5 **LPG installations**

a) LPG systems shall be in accordance with ISO 10239 or equivalent, which covers:
- working pressure of the system
- stowage of gas containers
- material and routing of LPG supply line
- installation, ventilation
- appliance and their connection
- leakage tests

PART VI – FIRE AND SAFETY SYSTEMS

1.0 Chapter 1 – Fire Safety

1.1 General

1.1.1 Application

a) Fishing vessels covered by these rules are to comply with the requirements in this Chapter.

b) Mandatory statutory requirements, such as those given by 46CFR Part 28, are to be complied with.

1.1.2 Documentation

Plans and documentation listed below shall be submitted for examination:

- Structural fire protection plan
- Penetration details drawing
- Fire main system drawings
- Fixed fire extinguishing arrangement
- Escape route plan (may be combined with the fire control plan)
- Fire control plan

See Part I Chapter 3, 3.5 "Plan Approval" for documentation showing compliance with rule requirements.

1.1.3 Definitions

a) A-60 class divisions:

Divisions constructed of steel, suitably stiffened and insulated with non-combustible material that is tested and approved to comply with the thermal and integrity requirements specified in IMO Resolution A.754(18) for one hour.

b) A-0 class divisions:

Divisions constructed of steel, suitably stiffened and approved to comply with the integrity requirements specified in IMO Resolution A.754(18) for one hour. Uninsulated steel bulkheads and decks of suitable scantlings and without openings are considered to satisfy the requirements for A-0 class divisions.

c) B-0 class divisions:

Divisions constructed of non-combustible materials and tested and approved to comply with the integrity requirements specified in IMO Resolution A.754(18) for 30 minutes. Combustible veneers may be permitted provided they are not able to produce excessive quantities of smoke and toxic products, and exposed surfaces in corridors and stairway enclosures have low-flame spread characteristics, this being determined in accordance with the IMO Fire Test Procedures Code or equivalent test standards.

1.2 Suppression of Fire

1.2.1 Fire Pumps

a) Vessels 24 m (79 ft.) or more in length shall be provided with at least one independent power driven fire pump.

b) Vessels less than 24 m (79 ft.) in length shall be provided with at least one power driven fire pump, which may be driven by the main engine.

c) The total capacity Q of the fire pump(s) is to be

$Q=\{0.15\ \sqrt{[L(B+D)]}+2.25\}^2$ m^3/h, where L, B and D are in meters

$Q=\{0.096\ \sqrt{[L(B+D)]}+4.72\}^2$ gpm, where L, B and D are in feet

minimum 18 m^3/h (80 gpm)

d) Each pump must be capable of delivering water simultaneously from the two highest hydrants, or from both branches of the fitting if the highest hydrant has a siamese fitting, at a pressure of at least 0.345 N/mm^2 (50 psi).

1.2.2 Fire mains, hydrants and hoses

a) The fire main shall have a diameter of sufficient size to maintain a steady distribution and pressure.

b) A sufficient number of fire hydrants shall be provided and so located that at least one powerful jet of water can reach any normally accessible part of the vessel. At least one hydrant shall be provided in, or adjacent to the entrance to the machinery space.

c) Not less than three (3) fire hoses, complete with couplings and nozzles, shall be provided. For vessels less than 24 m (79 ft.) the number may be specially considered, provided the requirements in b) are fulfilled.

1.2.3 Fire extinguishers

a) The type, number and certification of portable and semi-portable fire extinguishers is to be according the mandatory USCG requirements. See 46CFR Part 28, Subparts B and C.

<<<<Guidance Note>>>>

For practical information, see "Commercial Fishing Vessel Safety Digest" (latest edition) issued by Alaska Marine Safety Education Association (AMSEA).

<<<<End Guidance Note>>>>

1.2.4 **Fixed fire-extinguishing systems**

a) Vessels 24 m (79 ft.) or more in length shall be provided with a fixed fire-extinguishing system in enclosed spaces containing:

- An internal combustion engine of more than 50 hp (37 kW);
- An oil fired boiler;
- An incinerator; or
- A gasoline storage tank.

b) The fixed fire extinguishing system is to be approved and may be any of the following types:

- A fixed gas fire extinguishing system;
- A fixed high expansion foam fire-extinguishing system; or
- A fixed pressure water-spraying fire-extinguishing system.

1.2.5 **Galley fire protection equipment**

a) Each vessel shall have a grease extraction hood above each grill, broiler and deep fat fryer. Each grease extraction hood must be equipped with an approved pre-engineered dry or wet chemical fire extinguishing system.

b) At least one fire axe shall be located in or adjacent to the operating station.

1.2.6 ***Reserved***

1.2.7 **Fire detection**

a) Each vessel shall be equipped with suitable fire detection systems (smoke and/or heat) in accommodation spaces, galley and engine room.

1.2.8 **General alarm system**

a) Vessels with an accommodation space or work space which is not adjacent to the operating station must have an audible general alarm. The system must be able to be operated from the operating station and be capable of notifying an individual in any accommodation space or work space where they may normally be employed in the event of an emergency.

b) In a work space where background noise makes a general alarm system difficult to hear, a flashing red light must also be installed.

c) A public address system or other equivalent means of alerting all individuals on board may be used in lieu of a general alarm system.

<<<<Guidance Note>>>>

General alarm systems should be tested and marked in accordance with 46 CFR 28.240.

<<<<End Guidance Note>>>>

1.2.9 **Materials**

Vessels shall have noncombustible insulation materials, except insulation used for pipe and machinery lagging in machinery spaces and insulation in cargo spaces and refrigerated compartments of service spaces.

1.2.10 **Structural fire protection**

a) For vessels 24 m (79 ft.) and more in length: Boundaries of the wheelhouse and of the machinery spaces shall be A-60 class against adjacent spaces. Where, in the opinion of the Society, the adjacent spaces are of negligible fire risk, the boundaries may be A-0 class. For vessels less than 24 m (79 ft.), constructed of combustible materials, the Society may consider alternative standards. See also Guidance Note below.
Mandatory USCG requirements given in 46CFR Part 28 are to be followed.

b) Boundaries of escape routes shall be of B-0 class.

c) Each vessel carrying paint and flammable liquids must be equipped with a steel or a steel lined storage locker.

<<<<Guidance Note>>>>

For vessels less than 24 m (79 ft.), NVIC 5-86 Enclosure (1) on structural fire protection for new vessels may be used in lieu of the requirements in 1.2.10 a) and b).

<<<<End Guidance Note>>>>

1.2.11 **Fire-fighter's outfit**

Vessels are to be provided with fire-fighter's outfits as required by mandatory USCG requirements. See 46CFR Part 28 Subpart C.

1.2.12 **Ventilation of spaces containing gasoline**

Each space that contains a gasoline engine, a gasoline storage tank or gasoline piping connected to an integral gasoline tank must be open to the atmosphere and so arranged as to prevent the entrapment of vapors or be ventilated by a mechanical exhaust system with a nonsparking fan.

1.3 Escape

1.3.1 **Means of escape**

See Part II, Chapter 1 – Arrangement - Sec.1.2.5 and 1.2.6.

2.0 Chapter 2 - Safety of Personnel

2.1 General

2.1.1 Application

Mandatory requirements given in 46CFR Part 28 are to be followed.

<<<<Guidance Note>>>>

For practical information, see "Commercial Fishing Vessel Safety Digest" (latest edition) issued by Alaska Marine Safety Education Association (AMSEA).

<<<<End Guidance Note>>>>

2.1.2 Documentation

A safety plan shall be submitted for approval (may be combined with the fire control plan). The safety plan shall describe the arrangement of the lifesaving equipment.

2.2 Lifesaving Equipment

2.2.1 Ring Life Buoys, Life Preservers or other Personal Flotation Devices, Immersion Suits, Exposure Suits or TPAs, etc.

Mandatory requirements given in 46CFR Part 28 are to be followed.

2.2.2 Survival Craft

a) Each vessel must carry one or more approved survival craft (liferaft) with aggregate capacity for all persons aboard.

b) Mandatory requirements given in 46CFR Part 28 are to be followed. An approved lifeboat may be substituted for any survival craft. Other acceptable alternatives are also described in these regulations.

2.2.3 Stowage of survival craft

Each inflatable liferaft, inflatable buoyant apparatus, and any auxiliary craft used in their place, must be kept readily accessible for launching or be stowed so as to float free in the event the vessel sinks.

2.2.4 Launching of survival craft

A gate or other opening must be provided in the deck rails, lifelines or bulwarks adjacent to the stowage location of each survival craft which weighs more than 50 kg (110 lbs.), to allow the survival craft to be manually launched.

2.2.5 Distress Signals and Emergency Position Indication Radio Beacons (EPIRBs)

Mandatory requirements given in 46CFR Part 28 are to be followed.

2.3 Safety equipment

2.3.1 **Breathing Apparatus**

Mandatory requirements given in 46CFR Part 28 are to be followed.

2.3.2 ***Reserved***

2.3.3 **Deck rails, lifelines, storm rails, hand grabs and guards**

a) Deck rails, lifelines, grab rails or equivalent protection must be installed near the periphery of all weather decks accessible to individuals.

<<<<Guidance Note>>>>

The design should, to the extent possible, prevent interference with fishing operations and tripping or other hazards.

<<<<End Guidance Note>>>>

b) A suitable storm rail or hand grab must be installed where necessary in a passageway, at a deckhouse side, at a ladder, and a hatch where an individual might have normal access.

c) The height of deck rails, lifelines or bulwarks must be at least 1 m (39 in.) from the deck, except where this height will interfere with the normal operation of the vessel.

d) A stern trawler must have doors, gates or other protective arrangements at the top of the stern ramp at least as high as adjacent bulwarks or 1 m (39 in.), whichever is less.

e) Suitable hand covers, guards, or railing must be installed in way of machinery which can cause injury to personnel, such as gearing, chain or belt drives, and rotating shafting.

2.3.4 **Operation of Deck Gear**

Winches, cranes and other deck-gear shall be arranged to facilitate safe working with respect to instruction, operation, view and shielding. Winches with open lines, lifting platforms and all types of movable deck gear, shall be shielded or arranged with automatic emergency stop activated by a person.

PART VII - APPENDICES

This PART VII is under preparation, and will cover issues such as

- Sample and format of Certificates used with these rules
- Guidance for the builder (quality systems, documentation, procedures, scope, roles, meetings, etc.)
- Guidance for owners/operators (roles, processes, training, surveys, etc.)
- Use of aluminum for main hull structures (L<24m)
- Use of GRP for main hull structures (L<24m)